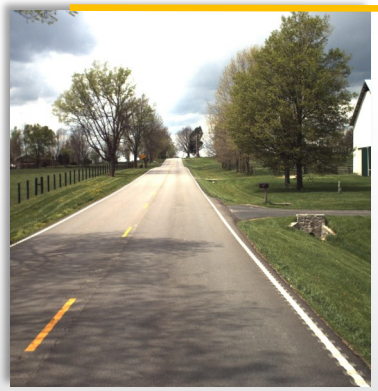
KY 151 Safety Study

Anderson and Franklin Counties

From US 127 to I-64
Alton Road/Graefenburg Road



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November 2016

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Executive Summary

The Kentucky Transportation Cabinet (KYTC) conducted a safety study for KY 151 from US 127 in Anderson County to Interstate 64 (I-64) in Franklin County as a special case study to address the safety concerns of the local residents and analyze the Commercial Motor Vehicle (CMV) crashes between January 1, 2010, and December 31, 2015. See **Figure ES-1, p. ES-5**.

The purpose of the KY 151 Safety Study is to:

- Review the existing roadway characteristics, traffic volumes, geometries, speeds, and crashes
- Determine which size of vehicles can be safely accommodated within the existing roadway geometry
- Identify and examine the CMV-specific issues

Background

In 2015, five CMV crashes were reported by the Kentucky State Police (KSP) along KY 151 between milepoint (MP) 0.0 in Anderson County and MP 2.3 in Franklin County. This segment of KY 151 serves as a shorter route between locations south of the KY 151 and US 127 intersection, and locations west of the KY 151 and I-64 interchange.

In March 2016, in response to local residents' concerns about the recent number of CMV crashes, KYTC and the Federal Highway Administration (FHWA) took immediate action to place an emergency ban on certain classes of large and oversized commercial motor vehicles, referred to as STAA vehicles, while the causes of the CMV crashes and safety aspects of the roadway were analyzed by KYTC. Banning of STAA vehicles permanently and removing KY 151 from the National Truck Network is contingent on FHWA's approval after providing formal notice to the public and offering opportunity for citizen comments in the Federal Register.

In May 2016, Civil Action No. 16-CI-440 was filed in the Franklin Circuit Court against the Commonwealth of Kentucky, KYTC, KYTC Secretary Greg Thomas, and the Department of Public Highways. The plaintiffs in the civil action are Mr. Thomas D. Isaac and Mr. Don McCormick, who are local residents representing "Group 151." In addition to the ban of the STAA vehicles, the plaintiffs have requested that KYTC ban all non-local trucks from the KY 151 study corridor. The plaintiffs define "trucks" as any vehicle having more than three axles. Exceptions would be made for single unit garbage trucks, emergency vehicles, and other similar vehicles.

KYTC evaluated the existing roadway characteristics, traffic volumes, roadway geometrics, speeds, crashes, and pavement conditions. The key transportation issues identified from this analysis are summarized on the next page.

Roadway Geometrics

There are 31 horizontal curves along KY 151, between US 127 and I-64. All of the curves meet current design guidelines for the posted speed limits. Fourteen horizontal curves were further analyzed to determine which CMV sizes might have difficulty maneuvering without the rear wheels tracking off of the pavement. Two curves at MP 2.6 and MP 3.0 in Anderson County may not fully accommodate the offtracking of STAA vehicles, confirming that removing KY 151 from the National Truck Network and prohibiting STAA vehicles was an appropriate action to balance the concerns of the local residents, government officials, and commercial vehicle traffic, with the possibility of the geometric conditions of the roadway contributing to the CMV crashes.

A review of the crash report narratives did not appear to indicate any of the CMV crashes were related to sight distance issues.

Speed Analysis

Speed data was collected at five locations on KY 151 in May 2016. The analysis indicates the 85th percentile speeds recorded, both for trucks and non-trucks, are within 5 mph of the posted speed limits which indicates the posted speed limit is appropriate for the roadway conditions.

Crash Analysis

Between January 1, 2010, and December 31, 2015, there were 19 CMV crashes out of 177 all-vehicle type crashes on KY 151 between US 127 and I-64. Five of the 19 CMV-related crashes were recorded by the KSP as not being caused by the CMVs. The heaviest concentration of CMV crashes occurred between the community of Alton and the Anderson/Franklin County line. The crash analysis indicated low shoulders along the roadway may be a contributing factor in three locations. To mitigate the initial findings of this study, KYTC Maintenance crews widened the three low-shoulder locations in fall of 2015 and spring of 2016. The CMV crashes between Alton and the county line not related to low shoulders appear to be random events related to conditions such as icy weather and driver fatigue.

Overall statistical analysis of the all-vehicle-type crashes shows that KY 151 is experiencing lower crash rates and lower severity of crashes than Kentucky roadways of similar functional classification.

Pavement Condition Evaluation

In April 2016, the KYTC Division of Maintenance, Pavement Management Branch, conducted a review of KY 151 in order to assess potential impacts of heavy trucks on pavement conditions in accordance with KYTC *Pavement Management in Kentucky* procedures. The review involved investigation of:

- current pavement conditions
- historical construction data
- prior condition assessments

Analysis of pavement ride quality and visual distresses indicated no evidence of abnormal distress patterns. The pavement structure for KY 151 is considered sufficient to accommodate the existing 'AAA' truck weight classification.

Road Safety Audit

The Road Safety Audit conducted on May 10, 2016, recommended improvements to the KY 151 corridor to improve the safety of the roadway.

Conclusions

Safety is a high priority with KYTC, as documented in KYTC's Mission statement:

> *"To provide a safe, efficient, environmentally sound and fiscally responsible transportation system that delivers economic opportunity and enhances the quality of life in Kentucky."*

As part of the Strategic Plan, KYTC's goals and objectives are to make well-informed, data-driven decisions to reduce the number and severity of motor vehicle crashes. This must be accomplished while also considering the local citizens' concerns, promoting economic development through improving freight movement, and managing limited transportation funds responsibly.

The KY 151 Safety Study evaluated the existing roadway characteristics, traffic volumes, roadway geometrics, speeds, crashes, and pavement conditions. The analysis shows the following:

- roadway capacity is not currently an issue, and will not likely be an issue in the next 20 years
- roadway geometrics, although not up to current industry guidelines, are not contributing to crash rates higher than what would be expected due to random occurrence
- existing traffic control devices are within industry guidelines
- posted speed limits are appropriate
- there are no apparent crash patterns indicating the roadway geometry is insufficient
- pavement conditions are fair
- the KY 151 study corridor has a better safety record than Kentucky roadways of similar functional classification in both rural and urban areas

The CMV-specific data and physical evidence were examined along the KY 151 corridor. The analysis and physical evidence indicate some of the CMV crashes may be related to offtracking and shoulder drop-offs at two curves located at MP 2.6 and MP 3.0, and the abrupt change in pavement width at MP 4.1 in Anderson County.

Although the analysis indicates STAA vehicles may have difficulty tracking within their 11-foot travel lanes at two of the curves in Anderson County, it does not necessarily indicate that the STAA vehicles must be removed from the KY 151 corridor. However, because of the proximity of US 127 as a viable alternate route and with the possibility of the roadway geometric conditions contributing to the CMV crashes, the Official Order prohibiting STAA vehicles was an appropriate action to balance the concerns of the local residents, government officials, and commercial vehicle traffic. A further ban on all CMVs, or trucks over three axles as requested by the civil action lawsuit is not supported by the analysis and would unjustifiably restrict freight movement.

While the crash analysis indicates the crashes along the corridor are likely occurring in a statistically random manner and are generally of lower severity than statewide averages, the overall evaluations indicate the CMV-related issues at MPs 2.6, 3.0, and 4.1 in Anderson County have the potential to be mitigated by a combination of improving the shoulders in the section of roadway between the community of Alton and the Anderson and Franklin County line, along with continuing to restrict the STAA vehicles. The STAA restriction reduced the overall percentage of CMVs on the study corridor by nearly half, thereby reducing the potential for CMV crashes along KY 151. Additional improvements to enhance safety along the corridor are listed in the Road Safety Audit section of this study. To address the initial findings of this study and improve safety along the corridor, the shoulders have been widened on the section of KY 151 between the community of Alton and the change in pavement width at MP 4.1.

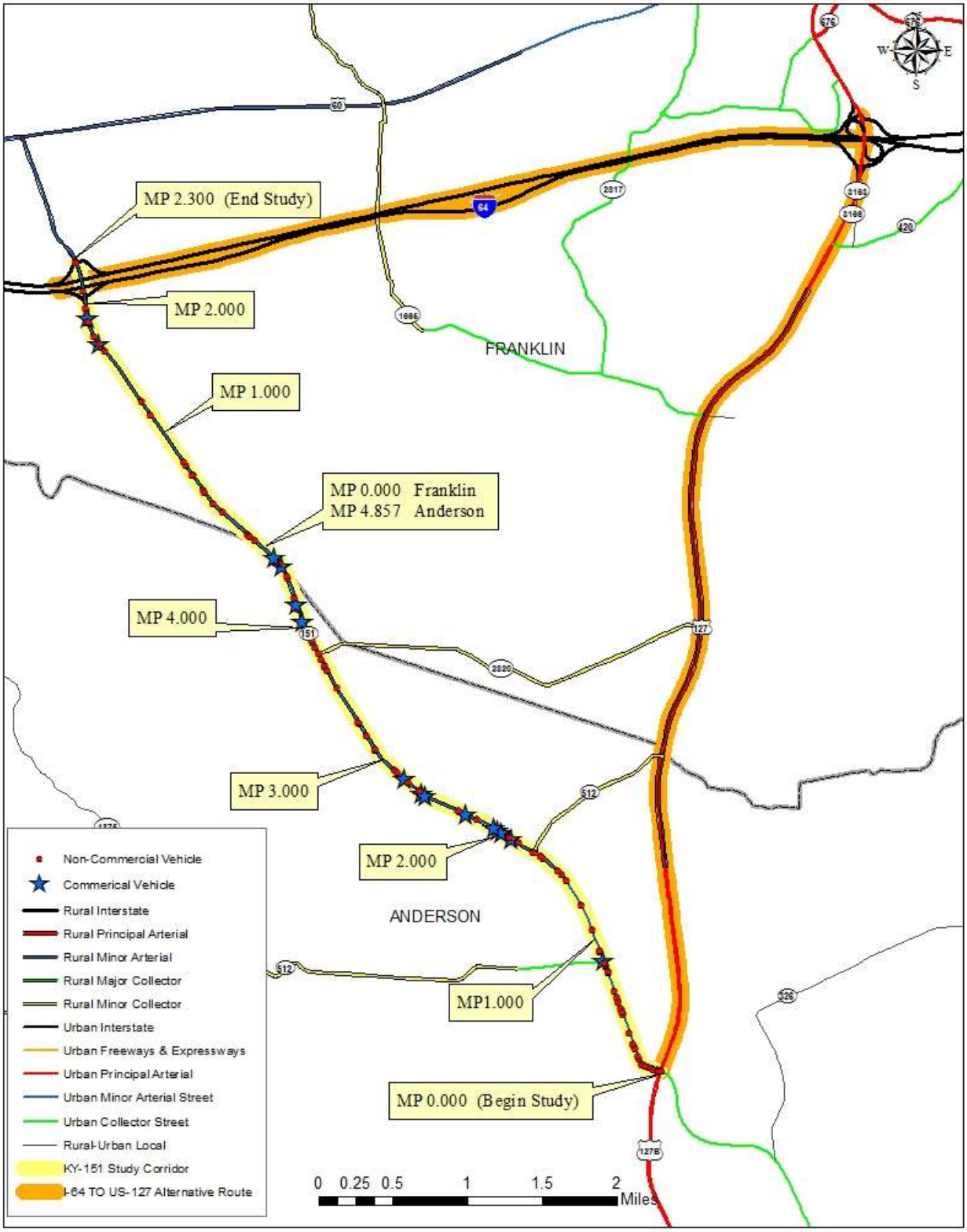


Figure ES-1 - KY 151 Safety Study Corridor

1. Study Overview

A. Study Purpose

The Kentucky Transportation Cabinet (KYTC) conducted a safety study for KY 151 from US 127 in Anderson County to Interstate 64 (I-64) in Franklin County as a special case study to address the safety concerns of the local residents and analyze the Commercial Motor Vehicle (CMV) crashes between January 1, 2010, and December 31, 2015.

The purpose of the KY 151 Safety Study is to:

- Review the existing roadway characteristics, traffic volumes, geometries, speeds, and crashes
- Determine which size of vehicles can be safely accommodated within the existing roadway geometry
- Identify and examine the CMV-specific issues

Fence and mailbox damaged by CMV crash in 2016

B. Study Setting

The KY 151 study corridor is a two-lane roadway which connects US 127 in Anderson County north of Lawrenceburg to I-64 in Franklin County west of Frankfort as shown in **Figure 1 (p.2).** The study corridor is approximately 6.9 miles in length and runs approximately south to north. The southern section of the roadway is locally known as Alton Road, while the northern part is known as Graefenburg Road. KY 151 in Anderson County begins at milepoint (MP) 0.0 at the US 127 intersection, and ends at the Anderson/Franklin County line, MP 4.587. The KY 151 study area in Franklin County begins at MP 0.0 at the Anderson/Franklin County line, and continues to MP 2.3 at I-64. KY 151 continues north of the I-64 interchange and ends at US 60 (MP 3.22).

The corridor is characterized by level and rolling terrain with farms, small residential communities, and generally locally-owned small businesses.

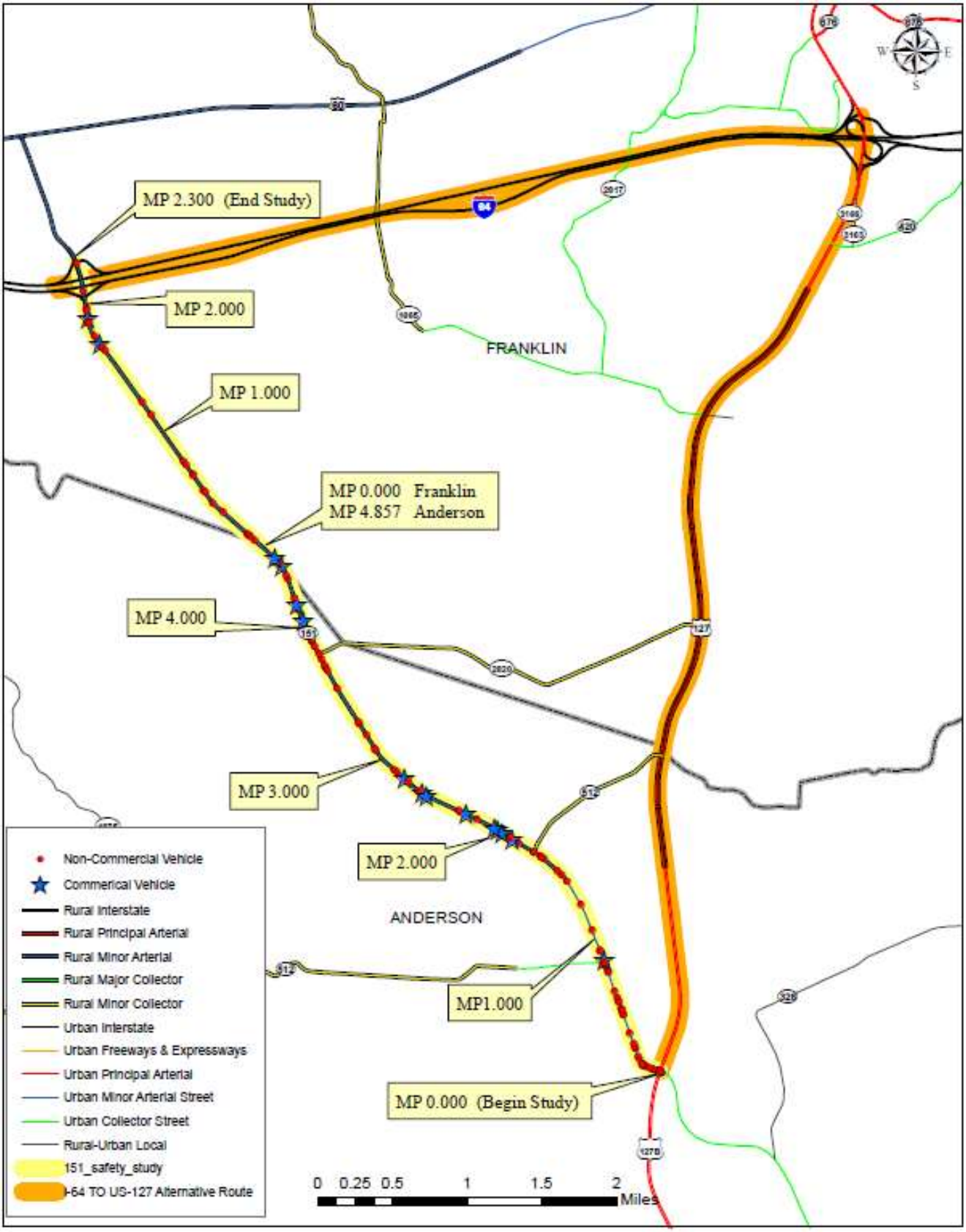


Figure 1 – KY 151 Safety Study Corridor

On the southern end of the corridor, the businesses include the Eagle Lake commercial development, the Florida Tile National Distribution Center, Inc., and Bluegrass Solutions (a truck-related business). Numerous businesses are located along the northern part of the corridor including Republic Services (locally known as the Benson Valley Landfill), two gas stations, and a large/heavy equipment supply business.

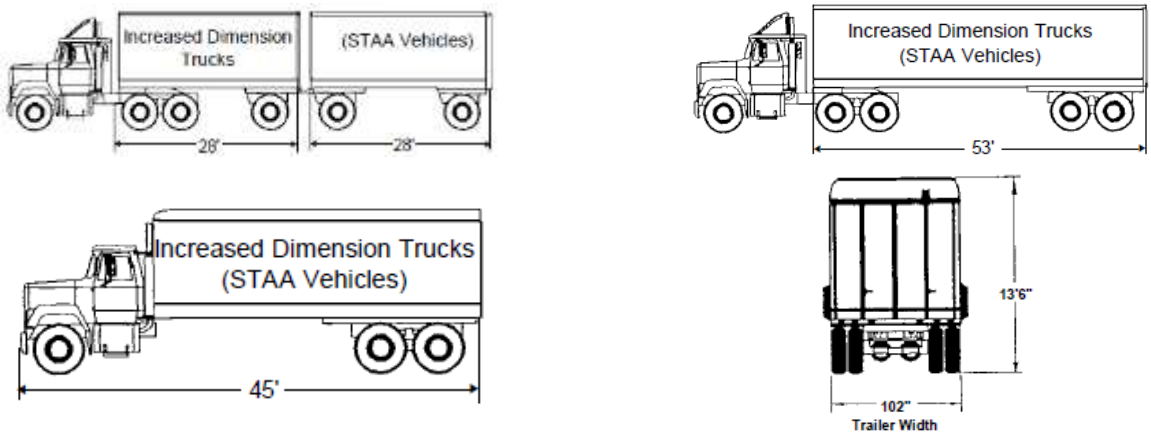
The KY 151 study corridor, highlighted in yellow in **Figure 1 (p.2)**, serves as a shorter route between locations south of the KY 151 and US 127 intersection, and locations west of the KY 151 and I-64 interchange. The alternative route, highlighted in orange in **Figure 1 (p.2)**, using US 127 to travel north to the US 127 and I-64 interchange, then traveling west on I-64 to the I-64 and KY 151 interchange, adds approximately 5 miles length, and 7½ minutes of travel time, versus using the KY 151 corridor. US 127 is a four-lane divided principal arterial roadway with a median and 4- to 10-foot paved shoulders.

C. Background

In 2015, five CMV crashes were reported by the Kentucky State Police (KSP) along KY 151 between MP 0.0 in Anderson County and MP 2.3 in Franklin County.

In March 2016, in response to local residents' concerns about the recent number of CMV crashes, KYTC and the Federal Highway Administration (FHWA) took immediate action to place an emergency ban on certain classes of large and oversized trucks, referred to as STAA vehicles (see the National Truck Network discussion in the paragraph below and the Kentucky National Designated Truck Network map in **Appendix A**), while the causes of the CMV crashes and safety aspects of the roadway were analyzed by KYTC. Banning of STAA vehicles permanently and removing KY 151 from the National Truck Network is contingent on FHWA's approval after providing formal notice to the public and offering opportunity for citizen comments in the Federal Register.

The National Truck Network was authorized by the Surface Transportation Assistance Act (STAA) of 1982 as specified in the U.S. Code of Federal Regulations (23 CFR 658). The CFR requires states to allow certain sizes of large and oversized trucks (STAA vehicles) on the National Truck Network to support interstate commerce. The network includes almost all of the Interstate Highway System and other, specified non-interstate highways. **Appendix A** details, and further defines, STAA vehicles and Kentucky's National Truck Network. KY 151 was placed on the National Truck Network at the inception of the network in 1982, prior to the completion of the US 127 bypass around the community of Alton.



Increased Dimension Trucks – STAA Vehicles

In May 2016, Civil Action No. 16-CI-440 was filed in the Franklin Circuit Court against the Commonwealth of Kentucky, KYTC, KYTC Secretary Greg Thomas, and the Department of Public Highways. The plaintiffs in the civil action are Mr. Thomas D. Isaac and Mr. Don McCormick, who are local residents representing Group 151. Group 151 is a group of local residents that are concerned with the CMV crashes along KY 151. In addition to the ban of the STAA vehicles, the plaintiffs have requested that KYTC ban all non-local trucks from the KY 151 study corridor. The plaintiffs define "trucks" as any vehicle having more than three axles. Exceptions would be made for single unit garbage trucks, emergency vehicles, utility vehicles, local construction vehicles, and for trucks accessing terminals, facilities, for food fuel, repairs, or rest. The plaintiffs assert that the trucks pose a danger to the personal safety of the traveling public.

D. Methodology

While most KYTC planning-type studies take, at a minimum, one year to complete, the KY 151 Safety Study was expedited due to the emergency safety aspects of the situation. This study focuses on the initial causes of the CMV crashes and does not include some aspects of typical planning-level studies including:

- Development of a Purpose and Need statement that explains to the public and decision-makers that expenditure of funds is necessary and worthwhile and that the priority of the work is warranted when compared to other needed highway projects
- A study of the environmental resources, including human resources (archeological, cultural, socioeconomic, etc.) and natural resources (threatened/endangered species, aquatic, geological, etc.)
- The involvement of the public and local officials, other than direct contact with local residents and Governor Bevin's office
- An analysis of roadside and clear zone features (the possible presence of utility poles, for example) that may impact the severity of crashes. A clear zone is considered an unobstructed, traversable roadside area designated to enable a driver to stop safely or regain control of an errant vehicle.
- A Level of Service analysis that measures the quality of traffic service based on motorists' expectations of traveling speed and density

Additional study and analysis may be required as any KY 151 improvement plans progress and as the purpose and needs of future projects are developed.

Although this study focuses on the CMV crashes, there are a relatively limited number of CMV crashes. The crash data, and corresponding KSP officers' crash reports for all vehicle types, along with the CMV crash reports, were obtained from the KSP's Kentucky Open Portal Solutions (KYOPS) Database and reviewed to identify any potential patterns and contributing causes, and to guide and focus the scope of this study.

This study uses the KYOPS database CMV Indicator to define crashes that are CMV-related.

KYTC and the Kentucky State Police (KSP) use the term CMV as defined by the Federal Motor Carrier Safety Administration and can generally be considered any motor vehicle used to transport passengers or property that:

- Has a gross vehicle weight of 10,001 pounds or more
- Transports more than 8 passengers for compensation
- Transports more than 15 passengers, not for compensation

E. Review and Summarization of Previous Corridor Documentation

A review of KYTC records shows the KY 151 corridor has been considered for improvements which are summarized in **Table 1**, below.

Table 1 – Summary of Previous Corridor Documentation

Study/PIF #	Year	Route	From	To	Description	Cost Est. (Millions)
[1]KY 151 Alton Bypass	1969	KY 151	Lawrenceburg Bypass	I-64	Determine the most feasible corridor for the reconstruction of US 127 and KY 151	$2 M
[2]Environmental Impact Statement (EIS)	1977	KY 151	340' NW of county line	I-64	2 lane initial, 4 lane ultimate	$0.45 M
Highway Plan Item No. 7-333	1995	KY 151	US 127	County line	Reconstruct KY 151 from US 127 in Anderson County to I-64 in Franklin County	$0.3 M
PIF 07 003 D0151 1.00	2010	KY 151	MP 0.000 Anderson Co.	MP 4.587 Anderson Co.	Reconstruct KY 151 from US 127 in Anderson County to I-64 in Franklin Co.	$32 M

[1] *KYTC website. "Route Study - KY 151 Alton Bypass." Transportation.ky.gov. http://transportation.ky.gov/Planning/Pages/Project-Details.aspx?Project=Route Study - KY 151 Alton Bypass, (posted June 2016).*

[2] *KYTC website. "Environmental Impact Statement US 127 and KY 151." Transportation.ky.gov. http://transportation.ky.gov/Planning/Pages/Project-Details.aspx?Project=Environmental Impact Statement (EIS) US 127 and KY 151, (posted June 2016).*

The previous study, titled *Route Study, KY 151 Alton Bypass from North End of Lawrenceburg Bypass to the Anderson-Franklin County Line and US 127 Alton Bypass*, was completed in 1969 prior to the construction of US 127 in its current location. Old Frankfort Road, US 512, was the original alignment of US 127, see **Figure 1 (p.2).** The study looked at alternative alignments for US 127 to bypass the community of Alton.

The 1977 Environmental Impact Statement (EIS) was also approved prior to the realignment of US 127 in its current location. The EIS analyzed the environmental conditions prior to the plan of constructing KY 151 as an initial two lane roadway and eventual four lane roadway with an interchange at US 127. KY 151 would have served as the primary movement of north-south traffic from Frankfort to and from locations south of Lawrenceburg instead of US 127 at the time of the 1977 EIS.

Project Identification Form (PIF) number 07 003 D0151 1.00 proposes a major widening along KY 151 from US 127 in Anderson County to I-64 in Franklin County to promote the safe and efficient movement of people, goods, and services for the benefit of all in the region. PIFs are used by KYTC to initially identify and document possible projects for KYTC to consider including in the statewide Highway Plan and include preliminary information such as general estimates and environmental concerns.

F. KY 151 in the 2016 Enacted Highway Plan

Currently, the KY 151 corridor is in the 2016 Enacted Highway Plan as follows:

Table 2 – [3]KY 151 in the 2016 Enacted Highway Plan

County	Item No.	Route	Description	Phase	Year	Amount
Anderson/ Franklin	05-806.00	KY 151	Reconstruct KY 151 from US 127 at Lawrenceburg to I-64 in Franklin County Funding Source: SPP	Planning	2017	$250,000
				Design	2017	$1,750,000
				Right of Way	2018	$5,000,000
				Utilities	2020	$5,000,000
				Construction	2022	$20,000,000
					Total	$32,000,000

[3]*KYTC website. "2016 Recommended Highway Plan." Transportation.ky.gov. http://transportation.ky.gov/Program-Management/Pages/2016-Recommended-Highway-plan.aspx (accessed June, 2016).*

G. Removing KY 151 from the National Truck Network

KYTC Petitions FHWA to remove KY 151 from National Truck Network

The KYTC submitted a request in March 2016, to the FHWA to remove KY 151 from the National Truck Network. On April 26, 2016, on an emergency basis, the FHWA granted contingent authorization to remove KY 151 from the National Truck Network. A formal notice was posted in the Federal Register allowing for a public comment period prior to permanent removal (see **Appendix A**).

KYTC Official Order Removing KY 151 from National Truck Network

On April 29, 2016, KYTC Secretary Greg Thomas signed Official Order 110134, removing KY 151 from the National Truck Network to ensure wider vehicles use a more appropriate route while promoting safety to the traveling public. The Official Order and the specific restricted vehicles dimensions can be seen in **Appendix A**.

In addition, the Official Order states motor vehicles with increased dimensions are allowed one driving mile from the designated National Truck Network for the purpose of attaining reasonable access to terminals, and facilities for food, fuel, repairs and rest.

2. KY 151 Roadway Characteristics

A. Functional Classification

Functional classification is the process which streets and highways are grouped into classes or systems, according to the type of traffic service they are intended to provide. In accordance with the FHWA and American Association of State Highway Officials (AASHTO) guidelines, the functional classification of KY 151 is urban minor arterial from US 127 to County Road (CR) 1022 (McCormick Road, MP 1.473 in Anderson County), and rural minor arterial from CR 1022 to I-64. Both urban and rural minor arterials provide service for trips of moderate length, serve geographic areas smaller than their higher arterial counterparts and offer connectivity to the higher arterial system. See **Figure 2**, right.

B. Traffic Volumes

The KYTC Traffic Count Reporting System has three traffic counting stations along KY 151 between US 127 and I-64. The Average Annual Daily Traffic (AADT) varies from 8,917 vehicles per day (vpd) at the southern end of the corridor towards US 127, to 5,215 vpd at the northern section by I-64. These counts, along with the corresponding truck percentages, can be seen in **Figure 2**, right, in **Table 3**, below, and are detailed in **Appendix B**.

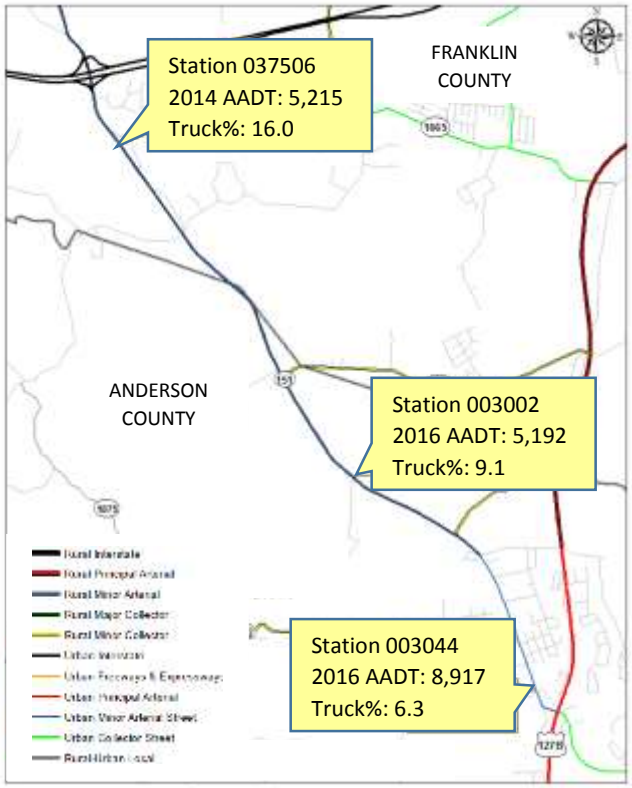


Figure 2 – Map of KY 151 Functional Classification and Traffic Counts

Table 3 – Traffic Volumes

Station ID	Begin – End Milepoints	Count Year	AADT (vpd)	% Single Trucks	% Combo Trucks	% *Illegal Combo Trucks	Total % Trucks	Truck AADT (vpd)
003044	0.000-1.761 Anderson Co.	2016	8,917	3.7	2.6	0.7	6.3	565
		2014	7,153	5.6	6.6		12.1	867
003002	1.761-4.587 Anderson Co.	2016	5,192	6.1	3.0	1.8	9.1	474
		2013	4,588	5.6	6.6		12.1	556
037506	0.000- 2.141 Franklin Co.	2014	5,215	9.4	6.7		16.0	837
For historic perspective		1969	**3,460				18.0	623

Numbers show the reduction in semi-trucks ((Combo, or Combination Trucks), see Effect of the STAA Ban discussion on p.8

**percentage of semi-trucks exceeding the STAA length ban in May 2016, 1 month after STAA ban was implemented*

***Count taken prior to US 127 realignment to present day alignment*

C. Effect of the STAA Vehicle Ban

The traffic count numbers highlighted in **Table 3 (p.7)** demonstrate the significant reduction in the percentage of combination trucks (% Combo Trucks) from 2013 and 2014 traffic volumes to 2016 volumes. The traffic volumes in 2016 were collected after the 2016 KYTC Official Order restricting STAA vehicles was implemented. The overall truck percentage (Total % Trucks) and percentage combination trucks (% Combo Trucks) both show significant reductions from pre-restriction measures. This indicates that the STAA restriction has resulted in a 50 percent reduction in semi-truck traffic on KY 151. Standard volume counting methods cannot distinguish vehicle widths and therefore it cannot be determined if any of the existing traffic exceeds the 96 inch width restrictions.

D. Capacity Analysis

The Transportation Research Board's Highway Capacity Manual 2010 (HCM 2010) defines roadway capacity as follows:

> *"The maximum sustainable hourly flow rate at which persons or vehicles reasonably can be expected to traverse a point or a uniform section of a lane or roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions."*

Volume to Capacity Analysis

Per the HCM 2010, the hourly directional capacity of a two-lane roadway is 1,700 passenger cars per hour per lane. Using the highest recorded AADT of 8,917 vpd, **Table 3 (p.7)**, and a one-direction traffic volume of 848 passenger cars per hour, the current volume to capacity (v/c) ratio is 0.50. The annual growth estimate from KYTC's statewide travel demand model for the study location is 1.1%. Therefore the one-direction traffic volume on KY 151 is projected to be approximately 1,055 passenger cars per hour per lane in 20 years. The v/c ratio in 20 years would then be 0.62. A roadway typically begins to experience capacity symptoms as it approaches a v/c ratio of approximately 0.70. Therefore, the v/c ratio of KY 151 is not an issue currently, and will not likely be an issue for the next 20 years. Capacity analysis details can be found in **Appendix B**.

Possible Crashes Related to Capacity

The crash reports for all vehicle types were reviewed to identify any capacity-related crash patterns, including crashes involving passing vehicles. Typically, as the v/c ratio increases, the demand for passing increases, and the crashes related to passing increase. In the six years of crash data reviewed, six of the 177 all-vehicle-type crashes appeared to be related to passing. Of the six passing-related crashes, four were caused by vehicles attempting to pass stopped or turning vehicles. The remaining two passing-related crashes appeared to be caused by vehicles illegally passing in no-passing zones. No capacity-related crash patterns were apparent.

Summary of the Capacity Analysis

Because the capacity calculations indicate there are no capacity issues currently or forecasted in the future and there was no apparent pattern of capacity-related crashes, the roadway capacity of KY 151 was not investigated further.

E. Roadway Geometric Analysis

A geometric analysis was conducted on KY 151 from the intersection with US 127 in Anderson County to the I-64 interchange in Franklin County. The analysis involved an overview of the horizontal geometry, vehicle offtracking, and vertical geometry. This planning-level geometric analysis is further explained in **Appendix C**.

Horizontal Geometry

According to KYTC's Highway Information System (HIS) database, there are 31 horizontal curves within the study limits (detailed in **Appendix C**). Seventeen of the curves listed in the HIS were not analyzed as they were not significant enough to show up on aerial photography or identified on existing roadway plans. Fourteen curves and their corresponding radii were identified through existing roadway plans or estimated from aerial photography.

Table 4 below shows the existing horizontal curve radii of each curve analyzed along with minimum radius for each curve based upon its design speed and an assumed maximum superelevation on the 8% e_{max} as detailed in the AASHTO's "A Policy on Geometric Design of Highways and Streets" 6th Edition (2011) (the Green Book).

Table 4 – Summary of Horizontal Curves

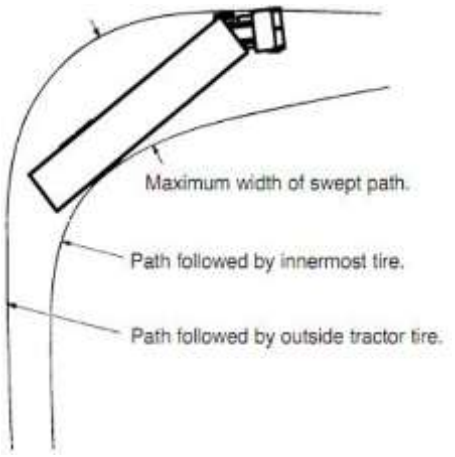
INAL	Milepoint	*Posted and Design Speed (mph)	Existing Curve Radius (feet)	Minimum Radius (feet) Per Current Design Guidelines
Anderson	**0.1**	45	**424	587
	1.2		2,000	587
	1.5		1,500	587
	1.7	35	1,433	314
	2.1	55	2,865	960
	2.6		1,146	960
	3.0		1,146	960
	3.5		5,730	960
	3.7		2,865	960
	4.0		2,865	960
	4.4		1,432	960
Franklin	**0.4**		1,432	960
	1.5		11,459	960
	1.8		1,432	960

**See Appendix C – Roadway Geometry Analysis Details*

***While the posted speed limit on the curve at MP 0.1, Anderson County, is 45 mph, it is reasonable to assume that vehicles are either slowing as they approach the intersection with US 127 or are accelerating from slower speeds after they travel through the intersection. In either case it is unlikely that the 45 mph speed limit is achieved in this location.*

Vehicle Offtracking

Vehicle offtracking was investigated following procedures outlined in AASHTO's Green Book to determine if CMVs might have difficulty maneuvering the curves without the rear wheels tracking off of the pavement. Fourteen horizontal curves were analyzed to determine how well they accommodate a full range of design vehicles from passenger cars to the currently prohibited STAA vehicles. The available pavement width was determined by field measured pavement widths for all 14 analyzed curves. The approximate curve radius of each curve on this corridor was taken from archived construction plans or estimated from aerial photography. Additional details showing many of the design vehicles that were analyzed as part of this study can be found on the Offtracking Analysis calculation sheets in **Appendix C.** The vehicle offtracking analysis determined that vehicles up to a wheel base of 50 feet, as measured from the center of the front axle to the center of the rear-most axle (WB-50: Wheel Base= 50 feet), would not encounter the problem of offtracking in the 14 curves analyzed. However, two curves at MP 2.6 and MP 3.0 in Anderson County may not fully accommodate the offtracking of STAA vehicles within the travel lane.



Vehicle Offtracking

Table 5 shows a summary of the calculated pavement widening by design vehicle. The cells highlighted in red indicate curves that may require additional widening to be able to accommodate the currently prohibited STAA vehicle types.

Table 5 – Summary of Curve Widening Analysis

		Pavement widening (feet)									
		Allowed Vehicles						Banned STAA Vehicles			
		84" Wide	96" Wide					96" Wide		102" Wide	
County	Milepoint	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Anderson	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.70	1.04
	3.0	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.74	1.40	1.74
	3.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Franklin	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

P=passenger car, BUS= bus, SU=single unit, WB=wheel base

Although the offtracking calculations show that some widening may be necessary for the STAA vehicles, guidance from chapter 3.3.10 of the AASHTO Green Book states:

> *"Widening is costly and very little is actually gained from a small amount of widening. It is suggested that a minimum of 0.6 m [2.0 ft] be used and that lower values…be disregarded."*

The KY 151 was also reviewed for physical evidence of offtracking. As shown in **Figure 3**, below, the curve located at MP 2.6 in Anderson County shows some evidence of scrubbing and tire rutting. This evidence, along with the calculated pavement widening for offtracking, supports the decision to remove KY 151 from the National Truck Network and prohibiting STAA vehicles.

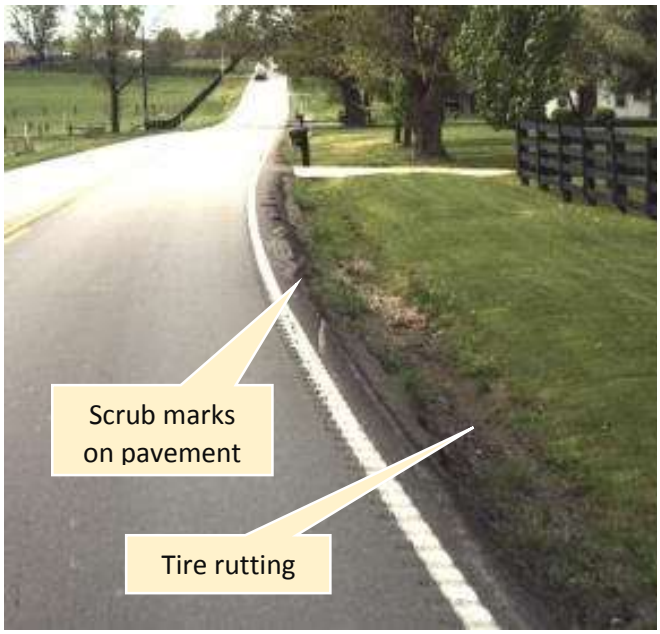


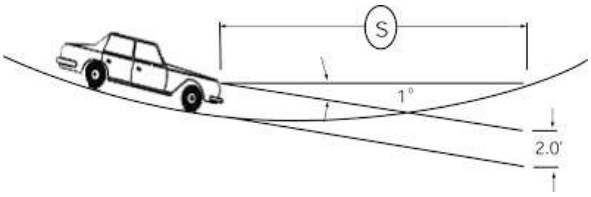
Figure 3: Scrub marks at MP 2.6, Anderson County

Figure 4: Curve at MP 3.0, Anderson County

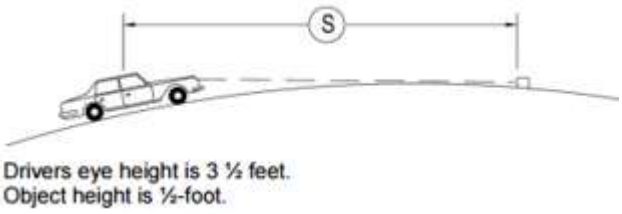
Vertical Geometry

The vertical geometry was investigated to determine if there are vertical curves not meeting current design guidelines for headlight sight distance and stopping sight distance. Forty-six vertical curves were analyzed for sight distance along the corridor. A table with the detailed analysis of the 46 vertical curves can be found in **Appendix C.** Eleven sag curves and nine crest curves do not meet current design guidelines for sight distance. These are summarized in **Table 6 (p.12)**. Of these 20 curves, 19 are located between Alton and I-64. Typical sight distance issues result in a pattern of rear-end type crashes. A review of the crash report narratives did not appear to indicate any of the CMV crashes were related to sight distance issues.

Vertical Curve Sight Distance



Sag Curve Headlight Stopping Distance



Crest Curve Stopping Sight Distance

Table 6 – Summary of Substandard Vertical Curves

	County	Curve Location	Posted Speed (mph)	Crest or Sag	Approximate Sight Distance (feet)	Current Design Guideline Sight Distance (feet)
1	Anderson	MP 0.16 - 0.19	45	Sag	292	360
2		MP 1.97 – 2.03	55	Sag	293	495
3		MP 2.04 – 2.09		Crest	415	495
4		MP 2.13 – 2.19		Crest	363	495
5		MP 2.21 – 2.29		Sag	215	495
6		MP 2.31 – 2.37		Crest	309	495
7		MP 2.39 – 2.42		Sag	331	495
8		MP 2.51 – 2.57		Crest	362	495
9		MP 2.73 – 2.81		Sag	387	495
10		MP 2.99 – 3.04		Crest	285	495
11		MP 3.15 – 3.28		Sag	432	495
12		MP 3.35 – 3.38		Sag	440	495
13		MP 3.47 – 3.54		Crest	309	495
14		MP 3.61 – 3.67		Sag	227	495
15		MP 3.68 – 3.72		Crest	427	495
16		MP 3.72 – 3.80		Sag	418	495
17		MP 3.96 – 4.01		Crest	350	495
18	Franklin	MP 0.46 – 0.55		Sag	475	495
19		MP 1.73 – 1.83		Sag	435	495
20		MP 1.86 – 1.99		Crest	458	495

F. Ball-Bank Indicator Analysis of Curves and Curve Warning Signs

Ball-Bank Indicator Study Methodology

Ball-bank studies are conducted to determine if the horizontal curves along a roadway warrant curve warning signs to alert the traveling public to a curve ahead. The collected data is evaluated to determine the appropriate advisory speed for a horizontal curve. The standards by which a ball-bank study is conducted and by which advisory speeds are set are based on guidance from FHWA's *Procedures for Setting Advisory Speeds on Curves*" and the "*Manual on Uniform Traffic Control Devices (MUTCD).*

In a ball-bank study, a curve is driven multiple times at a uniform speeds while readings from the speedometer and the ball-bank indicator are recorded. Additional runs are taken increasing the speed in 5 mph increments for each set of readings. The curve speeds that do not cause "driver discomfort" correspond to ball bank readings 16 degrees for 20 mph or less, 14 degrees for speeds of 25 to 30 mph, and 12 degrees for speeds of 35 mph and higher. The highest speed of travel at which the ball-bank indicator reading falls below the maximum allowed degree is the advisory speed.

Ball-Bank Analysis

Ball-bank data was collected in August 2016. Ball-bank readings were recorded at eight locations in both directions on KY 151 at the milepoints shown in **Table 7,** below, to determine the highest speed of travel at which the ball bank indicator reading falls below the maximum allowed degree. The corresponding advisory and posted speeds were recorded. If the advisory speed is less than the posted speed limit, an advisory speed plaque and curve warning sign is recommended. The ball-bank indicator analysis on KY 151 in Anderson County is shown in the **Appendix C**, along with an inventory of the curve warning signs in the study corridor.

The data in **Table 7** shows the resulting advisory speeds for each of the curve locations. Except for the one curve at MP 0.1 in Anderson County, all of the recorded ball-bank readings for the curves along the corridor were below the maximum allowed degree for the posted speeds. A 35 mph advisory speed is indicated at the curve located at MP 0.1 in Anderson County. While the posted speed limit on the curve is 45 mph, it is reasonable to assume vehicles are either slowing as they approach the US 127 intersection or are accelerating from slower speeds after they travel through the intersection. In either case, it is unlikely that the 45 mph speed limit is achieved in this location. The ball-bank analysis results show the advisory speed signage throughout the corridor is appropriate.

Table 7 – Summary of Ball Bank Indicator Advisory Speeds

County	Milepoint	Posted Speed (mph)	Advisory Speed (mph)	
			Northbound	Southbound
Anderson	0.1	45	-	35
	1.5	45	55	45
	1.7	35	55	50
	2.6	55	55	55
	3.0	55	55	55
	4.4	55	55	55
Franklin	0.4	55	55	55
	1.8	55	55	55

G. Speed Analysis

Spot Speed Study Methodology

Spot speed studies (speed studies) are conducted to determine the speed distribution of traffic currently using the roadway. The collected data is evaluated to determine the appropriate speed limit. The standards by which a speed study is conducted and by which speed limits are set are based on guidance from the MUTCD.

In the speed studies, the free-flow speed data from 50 to 100 vehicles is obtained through use of a radar device at a single location. Free flow speed is, in general, the speed at which a driver feels comfortable traveling without constraints from other drivers or traffic control devices. The collected data is then evaluated to find the speed 85% of the observed drivers are traveling at or below. This is commonly referred to as the 85th percentile speed and is used to determine the appropriate posted speed limit for the roadway. Speed limits establish an upper bound on speed and help lessen the differential in speed among drivers. This helps maintain an orderly flow of traffic and reduces the overall number of conflicts.

Speed Study on KY 151

Speed data was collected in 2016 at five locations on KY 151 at the milepoints shown in **Table 8** (also **Figure 5, p.15**) to determine vehicle speeds relative to the posted speed limit. Additionally, the speed studies conducted at MPs 1.761 and 2.900 in Anderson County separated the speed data into truck (box trucks and larger) speeds and non-truck speeds. The collected data was analyzed and 85th percentile speeds were recorded.

Speed Study Analysis

The data in **Table 8** shows the resulting 85th percentile speed from each of the locations. Generally, posted speed limits are set within 5 mph of the 85th percentile speed. The observed vehicle speeds in four of the study locations are within approximately 5 mph of the posted speed limit, which would indicate the posted speed limit is appropriate for the roadway conditions. One area differs from the posted speed limit by more than 5 mph is at MP 1.761 in Anderson County where a 35 mph speed zone is in effect (shown in red in **Table 8**).

Table 8 – Summary of Speed Data

County	Milepoint	Posted Speed Limit (mph)	*85th Percentile Speed (mph)	
			Northbound Traffic	Southbound Traffic
Anderson	0.740	45	46	45
	1.761	35	45 (non-trucks) 42 (trucks)	45 (non-trucks) 42 (trucks)
	2.900	55	60 (non-trucks) 56 (trucks)	57 (non-trucks) 55 (trucks)
	4.560	55	57	57
Franklin	1.900	55	54	48

**85th Percentile Speeds have been rounded to the nearest whole number*

Numbers in red indicate locations where the recorded speeds exceed the posted speeds by more than 5 mph

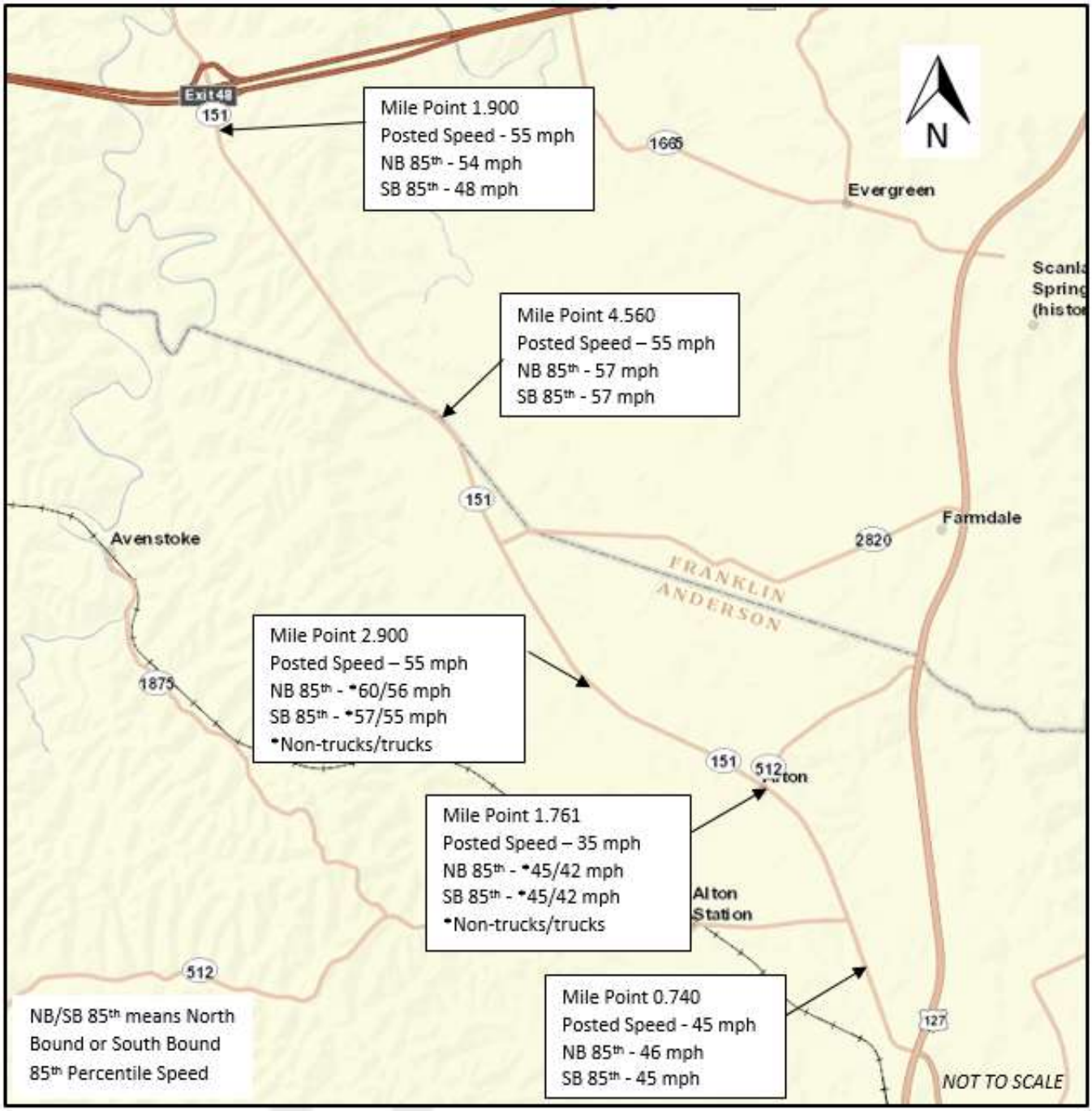


Figure 5 - Speed Studies on KY 151

H. Crash Analysis

Section Descriptions

For the purpose of crash analysis, the KY 151 corridor was considered in five logical sections based on similar characteristics in terrain, pavement typical sections, and posted speed limits as described in **Table 9** below. The CMV crashes that have occurred in Section 4, highlighted in **Table 9**, is the primary concern of the local residents.

Table 9 – Section Descriptions

Section	Begin MP	End MP	Length (miles)	Speed Limit (mph)	Location	Description
1	0.000	0.477	0.477	45	From US 127 to the Florida Tile entrance	Level and straight terrain, 12' lanes, 10' shoulders, 45 mph
2	0.477	1.473	0.996	45	Florida Tile entrance to 35 mph at Alton	Level and straight terrain, 11' to 12' lanes, 1' to 2' shoulders, 45 mph
3	1.473	1.990	0.517	35-45	Alton (35 mph and 45 mph through Alton)	Rolling terrain, 11' lanes, 1' to 2' shoulders, 35 mph, rumble strips on centerline and roadway edges
4	1.990	4.150	2.160	55	From 55 mph north of Alton to the change in pavement typical section	Rolling terrain, 11' lanes, 0' to 2' shoulders, 55 mph, rumble strips on centerline and roadway edges
5	4.150 Anderson Co.	2.300 Franklin Co.	2.737	55	From change in pavement typical section to I-64	Rolling terrain, 12' lanes, 4' to 10' shoulders, 55 mph, rumble strips on centerline and roadway edges

Crash records and reports for the KY 151 corridor were obtained from the KSP's Kentucky Open Portal Solutions (KYOPS) Database through the KYTC Highway Information System database extract. Crashes occurring in parking lots and on the I-64 ramps were not included in the scope of this study.

Between January 1, 2010, and December 31, 2015, there were a total of 177 all-vehicle-type crashes along the study corridor. These are detailed in the Crash Records charts in **Appendix D**. Nineteen of the 177 crashes involved CMVs, either as the vehicle causing the crash or as the vehicle being struck by another vehicle. The crash report narratives were also reviewed for all 177 crashes to identify any potential patterns and contributing causes. Crash report narratives contain the responding officer's written narrative of the crash events. A summary of the crashes for each section is detailed in **Table 10 (p.18).**

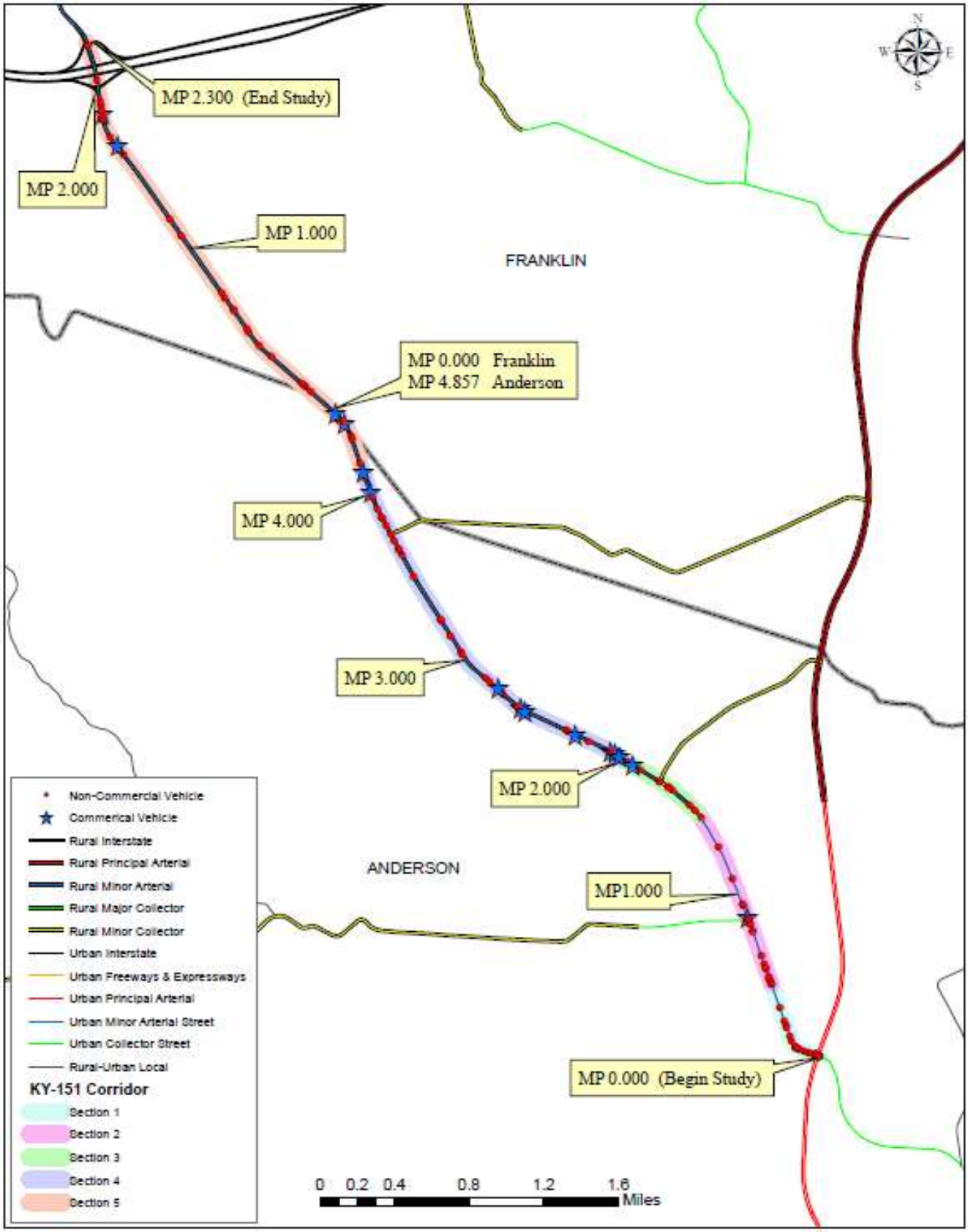


Figure 6 – Map of 2010 to 2015 Crashes

Table 10 – Summary of Crashes by Section

Section	Beginning MP	Ending MP	Length (miles)	% of Corridor Length	All Vehicle Types		CMVs Only	
					Crashes in Section	% of all crashes	Crashes in Section	% of CMV Crashes
1	0.000	0.477	0.477	6.9	48	27	0	0
2	0.477	1.473	0.996	14.5	23	13	1	5
3	1.473	1.990	0.517	7.5	10	6	1	5
*4	1.990	4.150	2.160	31.3	39	22	11	58
5	4.15 Anderson Co.	2.300 Franklin Co.	2.737	39.7	57	32	6	32
Totals			6.894	100	177	100%	19	100%

**section of concern to local residents*

Critical Crash Rate Factor

KYTC uses a systematic procedure to identify locations having high crash rates. The actual number of crashes, as obtained from the KYOPS database, occurring within a roadway segment is used to calculate the Actual Crash Rate using the number of crashes, roadway length, AADT, and the number of years for which crash data is being examined. Using an analysis procedure from the Kentucky Transportation Center and referenced in *The Analysis of Traffic Crash Data in Kentucky (2010-2014)*, Actual Crash Rates are compared to the Critical Crash Rate for similar types of Kentucky roadways. The Critical Crash Rate is the rate which is greater statistically, than the average crash rate for similar roadways and represents a rate above which crashes may be occurring in a non-random fashion. This ratio of Actual Crash Rate to the Critical Crash Rate is the Critical Crash Rate Factor (CRF). Thus, a CRF greater than 1.0 indicates crashes may be occurring more often than can be attributed to random occurrence. This procedure is used as a screening technique indicating locations where further analysis may be needed. It is not a definitive statement of a crash problem, nor a measurement of a crash problem.

Using six years of crash data between January 1, 2010, and December 31, 2015, the KY 151 corridor was analyzed using a 0.1 mile spot analysis; a 0.3 mile spot analysis; and a segment analysis of each section as defined in **Table 9 (p.16)**. **Appendix D** provides the detailed spot crash analyses.

0.1 Mile Spot Crash Analysis

The individual 0.1 mile spot analysis highlighted five 0.1 mile spots where the CRF approached or was greater than one:

- the intersection of KY 151 with US 127
- the county line
- Three spots at the area of KY 151 close to the I-64 interchange and commercial businesses

Higher crash rates near intersections and interchanges are to be expected. Crashes at intersections and interchanges are analyzed using different AADTs than the corridor. Traffic counts along the corridor do not typically account for the increased traffic due to the proximity of the intersection or interchange, the nearby businesses, and the higher turning movement frequencies. The US 127 intersection and I-64 interchange are not within the scope of this corridor study. The CRF at the Anderson/Franklin county line is 0.89 and can be attributed to crash reporting errors. In many instances, if the exact milepoint location of a crash is unknown, the reporting official may record the location at the nearest known point, which in this case would be the county line. The other CRFs for the 0.1 mile spot analysis ranged from 0 to 0.57, suggesting the crash rates at any 0.1 mile spot is within what would be expected for other similarly classified roadways in Kentucky.

0.3 Mile Spot Crash Analysis

The individual 0.3 mile spot analysis highlighted four 0.3 mile spots where the CRF approached or was greater than one:

- One spot at the intersection of KY 151 with US 127
- Three spots at the area of KY 151 close to the I-64 interchange and commercial businesses

Again, higher crash rates near intersections and interchanges are expected, and are analyzed using different AADTs, and are not within the scope of this study. The other CRFs for the 0.3 mile spot analysis ranged from 0 to 0.53, suggesting the crash rates at any 0.3 mile spot is within what would be expected for other similarly classified roadways in Kentucky.

Section Crash Analysis

The roadway section crash analysis highlighted only one section where the CRF approached or was greater than one. Section 1 had a CRF of 1.04, but as can be seen from the 0.1 and 0.3 spot analyses, the majority of the crashes in Section 1 occurred at the intersection of US 127 and KY 151 (see **Appendix D, Crash Records, Section 1**), which would be analyzed using different traffic counts. The other CRFs for the section/segment analysis ranged from 0.27 to 0.59, suggesting the crash rates in the sections are within what would be expected for other similarly classified roadways in Kentucky.

Some of the geometric features, crash details, and CRFs for each of the sections are summarized as follows.

Section 1 – KY 151: from US 127 (MP 0) to the Florida Tile entrance (MP 0.477)

Between January 1, 2010, and December 31, 2015, there were a total of 48 crashes, with no CMV crashes, in Section 1. This number represents 27% of the total crashes along 7% of the 6.894 mile corridor (see **Table 10, p.18).** This is one of two sections of the KY 151 corridor where the CRF exceeds 1.0, the other section being in proximity to I-64. Again, the majority of the crashes in Section 1 occurred at the intersection of US 127 and KY 151 and would be analyzed using different data. The other CRFs for this section range from 0.06 to 0.57, suggesting the crash rates in this section are within what would be expected for other similar roadways in Kentucky. The predominant crash types are summarized in **Table 11a** on the following page.

Table 11a – Section 1 Predominant Crash Types

Predominant Crash Type	Total Number of Crashes	Number of Crashes	
		Occurring at Night	Involving CMVs
Angle Collision	2		
Backing	1		
Head On	2		
Rear End	37	5	
Side Swipe – same direction	1		
Side Swipe – opposite direction	1		
Single Vehicle	4	4	
Total Crashes	48		

Section 1 recorded 37 rear end type crashes. Twenty-eight of the rear end crashes occurred at the intersection of US 127 and KY 151 and five occurred at the Eagle Lake entrances, mostly due to inattention to stopped or turning vehicles. The crashes resulted in either minor injuries or property damage only.

The **Table 11b** details the predominant contributing factor to the crashes in this section.

The crashes resulted in the following:

- 2 non-incapacitating injuries
- 6 possible injuries
- 40 property damage only

Table 11b – Section 1 Crash Contributing Factors

Factors	Number of Crashes
Inattention	40
Lost control/weather	4
Deer	3
Alcohol	1
Total	48

Section 2 – KY 151: from the Florida Tile entrance (MP 0.477) to Alton (MP 1.473)

Between January 1, 2010, and December 31, 2015, there were a total of 23 crashes, with one CMV crash, in Section 2. This number represents 13% of the total crashes along 14% of the 6.894 mile corridor (see **Table 10, p.18**). The CRFs in Section 2 range from 0.0 to 0.51, suggesting the crash rates in this section are within what would be expected for other similar roadways in Kentucky. The predominant crash types are summarized as follows:

Table 12a – Section 2 Predominant Crash Types

Predominant Crash Type	Total Number of Crashes	Number of Crashes	
		Occurring at Night	Involving CMVs
Angle Collision	3		
Opposing Left Turn	3	1	
Rear End	7		
Side Swipe – same direction	3		
Side Swipe – opposite direction	1		1
Single Vehicle	6	2	
Total Crashes	23		

The **Table 12b** details the predominant contributing factor to the crashes in this section.

The crashes resulted in the following:

- 1 incapacitating injury
- 2 non-incapacitating injuries
- 5 possible injuries
- 15 property damage only

Table 12b – Section 2 Crash Contributing Factors

Factors	Number of Crashes
Inattention	13
Lost control (wet/snow)	3
Shoulder Drop-Off	1
Backing up	1
Mechanical Failure/Debris	3
Alcohol	1
Work zone-related	1 (CMV)
Total	23

Section 3 – KY 151: Alton (MP 1.473 to MP 1.990)

Between January 1, 2010, and December 31, 2015, there were a total of 10 crashes, with one CMV crash, in Section 3. This number represents 6% of the total crashes along 8% of the 6.894 mile corridor (see **Table 10, p.18**). The CRFs in Section 3 range from 0.10 to 0.51, suggesting the crash rates in this section are within what would be expected for other similar roadways in Kentucky. The predominant crash types are summarized as follows:

Table 13a – Section 3 Predominant Crash Types

Predominant Crash Type	Total Number of Crashes	Number of Crashes	
		Occurring at Night	Involving CMVs
Angle Collision	3	1	
Opposing Left Turn	1		
Rear End	3	1	
Single Vehicle	3		1
Total Crashes	10		

The **Table 13b** details the predominant contributing factor to the crashes in this section.

The crashes resulted in the following:

- 4 non-incapacitating injuries
- 6 property damage only

Table 13b – Section 3 Crash Contributing Factors

Factors	Number of Crashes
Turkey	1
Inattention	4
Shoulder Drop-Off	1 (CMV)
Medical	2
Mechanical Failure	1
Night/no lights on vehicle struck	1
Total	10

Section 4 – KY 151: from the 55 mph north of Alton (MP 1.990) to the change in pavement section (MP 4.150)

Between January 1, 2010, and December 31, 2015, there were a total of 39 crashes, with 11 of those involving CMVs, in Section 4. After reviewing written narrative portions of the KSP crash reports, the crash numbers in this section have been adjusted to include two additional CMV crashes as the milepoints appeared to be incorrectly reported. The 39 crashes represent 22% of the total crashes along 31% of the 6.894 mile corridor, and the

11 CMV crashes represent 58% of the total CMV crashes along the corridor **(**see **Table 10, p.18).** The CRFs in Section 4 range from 0.00 to 0.58, suggesting the crash rates in this section are within what would be expected for other similar roadways in Kentucky. The predominant crash types are summarized as follows:

Table 14a – Section 4 Predominant Crash Types

Predominant Crash Type	Total Number of Crashes	Number of Crashes	
		Occurring at Night	Involving CMVs
Angle Collision	1		
Backing	1		
Head On	1		
Rear End	5		
Side Swipe – opposite direction	2	1 (1 w/ CMV)	1
Single Vehicle	29	13 (2 w/ CMVs)	10
Total Crashes	39		

The **Table 14b** details the predominant contributing factor to the crashes in this section.

The crashes resulted in the following:

- 2 incapacitating injuries
- 2 non-incapacitating injuries
- 3 possible injuries
- 32 property damage only

Table 14b – Section 4 Crash Contributing Factors

Factors	Number of Crashes
Deer	10
Inattention	8
Shoulder Drop-Offs	6 (6 CMVs)
Snow/Ice	6 (3 CMVs)
Mechanical Failure	2
Fell Asleep	2 (1 CMV)
Cell Phone	1
Other (lost control/alcohol/unknown)	4 (1 CMV)
Total	39

Section 5 – KY 151: from the change in pavement section (MP 4.150, Anderson Co.) to I-64 (MP 2.3, Franklin Co.)

Between January 1, 2010, and December 31, 2015, there were a total of 57 crashes, with six of those involving CMVs, in Section 5. The 57 crashes represent 32% of the total crashes along 40% of the 6.894 mile corridor, while the six CMV crashes represent 32% of the total number of CMV crashes (see **Table 10, p.18).** Of the six CMV crashes in this section, five of the CMV crashes were caused by non-CMV vehicles striking CMVs. This is the second of two sections of the KY 151 corridor where the CRFs approach and exceed 1.0. The higher spot CRF values ranged between 0.96 and 1.79. The majority of the crashes in Section 5 occurred at the I-64 interchange and would typically be analyzed using different data. The crash rate at the Anderson/Franklin county line is 0.89 and can be attributed to crash reporting errors. The other CRFs for Section 5 range from 0.00 to 0.56 with an overall section/segment CRF of 0.51, suggesting the crash rates in this section are within what would be expected for other similar roadways in Kentucky. The predominant crash types are summarized in **Table 15a** on the following page.

Table 15a – Section 5 Predominant Crash Types

Predominant Crash Type	Total Number of Crashes	Number of Crashes	
		Occurring at Night	Involving CMVs
Angle Collision	11		2
Backing	1		1
Head On	1		
Opposing Left Turn	4	1	
Rear End	5		1
Side Swipe – opposite direction	3	1	2
Side Swipe – same direction	4		
Single Vehicle	28	15	
Total Crashes	57		

The **Table 15b** details the predominant contributing factor to the crashes in this section.

The crashes resulted in the following:

- 4 non-incapacitating injuries
- 8 possible injuries
- 45 property damage only

Table 15b – Section 5 Crash Contributing Factors

Factors	Number of Crashes
Inattention	27 (*3 CMVs)
Deer	21 (*1 CMV)
Lost Control/Weather	3
Fell Asleep	2
Mechanical Failure	2 (*2 CMVs)
Alcohol/Drugs	2
Total	57

**5 of the 6 crashes were caused by non-CMV vehicles*

CMV Crashes

Because of the relatively low volume of CMVs and CMV-related crashes, there are limitations in performing a robust statistical analysis of the CMV crashes or clearly establishing CMV-specific crash patterns. Therefore, any findings presented in this CMV Crashes portion of the KY 151 study should be qualified by the limited sample size of available CMV-related data.

Prior to the STAA restriction, the total percentage of trucks varied from about 12% to 16% **(Table 3, p. 7)**. CMV crashes represented 19 of the 177 crashes, or 11% of the total number of crashes. This indicates CMVs did not represent a disproportionate number of the total number of crashes along the KY 151 study corridor. As seen in **Table 16 (p.24)**, when Section 4 between the community of Alton and the change in pavement width at MP 4.1 was analyzed, there were 11 CMV crashes as compared to 39 all-vehicle-type crashes, or 28% of the total number of crashes in Section 4. This indicates the number of CMV crashes may have been disproportionate in comparison to the total number of crashes in Section 4. When the STAA restriction went into effect in April 2016, the volume of CMVs was reduced by approximately half **(Table 3, p.7)**. The effect of this change is not yet known.

Table 16 – Comparison of CMV Crashes to the Total Number of Crashes by Section

	Beginning MP	Ending MP	Total Number of Crashes	Number of Crashes Involving CMVs	% of CMV Crashes
Section 1	0.000	0.477	48	0	0%
Section 2	0.477	1.473	23	1	4%
Section 3	1.473	1.990	10	1	10%
Section *4	1.990	4.150	39	11	28%
Section 5	4.15 Anderson Co.	2.300 Franklin Co.	57	6	11%
Full corridor	0.000 Anderson Co.	2.300 Franklin Co.	177	19	11%

**section of concern to local residents*

The CMV crash report narratives were reviewed to identify any potential patterns and contributing causes and are summarized in **Table 17 (p.25)**.

As can be seen in **Table 17 (p.25)**, seven of the 19 CMV crashes appear to be related to shoulder drop-offs. The remaining 12 crashes appear to be more random occurrences related to weather, driver fatigue, inattention, and mechanical failure. It should be noted that five of the 19 CMV crashes were reported by the KSP as not being caused by the CMVs.

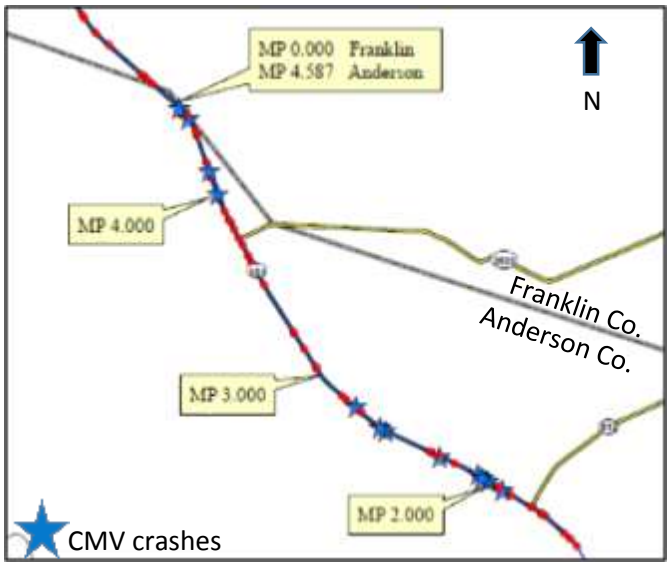


Figure 7 – CMV Crash Clusters

When the CMV crashes are mapped by milepoint, as seen in **Figure 7**, the CMV crashes appear to be clustered in three locations in Anderson County: at approximately MP 2.0, MP 2.6, and MP 4.1. When the contributing cause from **Table 17 (p.25)** is reviewed at each of these three locations, along with the geometric analysis and the physical evidence, it appears that the low and/or narrow shoulders may be contributing to the CMV crashes. Due to the relatively low number of CMV crashes, it is difficult to clearly establish a statistical cause. The CMV crashes located close to MP 4.1 in Anderson County are unusual because the roadway is generally straight, the terrain is open, and the horizontal curves in proximity to this area have relatively large radii. All three of the CMV crashes attributed to shoulder drop-offs in this location were southbound on KY 151 in the vicinity of an abrupt change in pavement width where the travel lane changes from 12-foot lanes to 11-foot lanes, and the shoulders change from approximately 10-foot paved shoulders to 0- to 2-foot combination shoulders. This suggests that CMVs exiting from I-64 and traveling southbound on KY 151 may be surprised by the abrupt change in pavement width.

Table 17 – Summary of CMV Crashes

	County	Section	MP	Date of Crash	Summary of the Crash Report Narratives	[1]Unit 1 Vehicle Type	[2]Unit 2 Vehicle Type	Crash Contributing Causes
1	Anderson	2	0.873	06/02/14	Construction work zone incident.	Truck Tractor, Semi-Trailer	Other	Work Zone
2		3	1.931	05/22/13	Dropped off the shoulder.	Truck Tractor, Semi-Trailer	[3]N/A	Shoulder dropoff
3		4	2.013	06/24/14	A NB vehicle drifted into the southbound lane causing the CMV driver to swerve off the roadway to miss the errant vehicle.	Truck Tractor, Semi-Trailer	N/A	Inattention Not caused by the CMV
4			2.043	08/18/15	The CMV struck a tree after the front passenger-side wheel dropped off the pavement.	Truck Tractor, Semi-Trailer	N/A	Shoulder dropoff
5			2.069	05/14/15	The CMV veered off the roadway because of inattention or fatigue and struck a tree.	Truck Tractor, Semi-Trailer	N/A	Fatigue
6			2.277	02/07/11	The SB CMV drifted off the roadway then overcorrected, crossed KY 151 and crashed on the opposite side.	Truck Tractor, Semi-Trailer	N/A	Shoulder dropoff
7			2.567	12/30/11	The CMV driver reported he didn't know what had happened to cause the crash.	Truck Tractor, Semi-Trailer	N/A	Possible shoulder dropoff
8			2.596	03/04/15	Lost control due to heavy snow and ice conditions.	Truck, Trailer	N/A	Weather
9			2.751	02/15/10	Lost control due to heavy snow and ice conditions.	Truck, Trailer	N/A	Weather
10			3.983	01/03/14	SB, the CMV dropped off the shoulder and was unable to correct the back onto the travel lanes, and overturned.	Truck Tractor, Semi-Trailer	N/A	Shoulder dropoff
11			4.101	10/12/15	A SB CMV crossed over into the northbound lane and side-swiped a passenger car to avoid hitting a previous crash.	Truck, Trailer	Passenger Car	Avoiding a previous crash
12			4.370	10/12/15	SB, a vehicle in front of the CMV driver was making a U turn, the CMV dropped a wheel off of the pavement while trying to avoid the other vehicle and was unable to redirect the vehicle back onto the travel lanes, then overturned.	Truck Tractor, Semi-Trailer	N/A	Shoulder dropoff
13			4.440	04/29/13	SB, the CMV dropped off the shoulder and couldn't redirect back onto the travel lanes.	Truck Tractor, Semi-Trailer	N/A	Shoulder dropoff
14	Franklin	5	0.092	11/27/12	A garbage truck had stopped to pick up trash and was struck by a passenger car withbrake problems.	Passenger Car	Truck, Single Unit	Inattention Not caused by the CMV
15			0.178	01/15/10	The NB CMV was struck by a SB pickup truck that swerved into the northbound lane due to mechanical failure.	Light truck (Van/Sports Utility/Pickup)	Truck Tractor, Semi-Trailer	Mechanical failure Not caused by the CMV
16			0.608	12/09/10	A SB pickup truck had pulled into a right turn lane then made a left turn across the roadway. The CMV struck the pickup truck as the pickup turned in front of it.	Light truck (Van/Sports Utility/Pickup)	Truck Tractor, Semi-Trailer	Inattention Not caused by the CMV
17			1.705	08/06/14	The CMV was backing out of a parking lot and was struck by another vehicle.	Truck-other Combination	Light truck (Van/Sports Utility/Pickup)	Inattention
18			1.761	09/28/12	The CMV swerved and overcorrected when an animal ran across the roadway and struck another vehicle.	Light truck (Van/Sports Utility/Pickup)	Truck, Trailer	Animal strike
19			1.897	06/22/12	The CMV was traveling SB and a northbound pickup truck misjudged the distance and clipped the rear of the CMV while turning left into a gas station	Light truck (Van/Sports Utility/Pickup)	Truck, Trailer	Inattention Not caused by the CMV

NB: northbound; SB: southbound

1: Unit 1 is the vehicle attributed to causing the crash as reported by the KSP

2: Unit 2 is the vehicle that was struck by Unit 1 as reported by the KSP

3: N/A = no other vehicle was struck

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Change in paved width at MP 4.1, Anderson County, looking southbound

To mitigate the possibly low or narrow shoulders contributing to the CMV crashes at the three locations, the shoulders between Alton and MP 4.1 have been widened to address the initial findings of this study.

Shoulder widening in Alton area

Shoulder widening

Comparison of Crash Rates: KY 151 vs Statewide Averages

KYTC uses a systematic procedure to identify locations having high rates of crashes. The actual number of crashes occurring within a roadway location is used to calculate the Actual Crash Rate, using the roadway length, AADT, and the number of years for which crash data is being examined. **Table 18** compares the Crash Rates on KY 151 to other Minor Arterial roadways in Kentucky. KY 151 has a better safety record compared to similar roadways in Kentucky.

Table 18 – Comparison of Crash Rates: KY 151 vs Statewide

	Crash Rate: Number of Crashes per 100 Million Vehicle Miles					
	Urban Sections			Rural Sections		
	All Crashes	Fatality Crashes	Injury Crashes	All Crashes	Fatality Crashes	Injury Crashes
KY 151	308	0	70	196	0	43
*Statewide Average	460	1.0	80	200	2.1	200

*From the Kentucky Transportation Center, *The Analysis of Traffic Crash Data in Kentucky (2010-2014), Statewide Crash Rates by Functional Classification (2010-2014) – Minor Arterials*

KY 151 Urban section: from MP 0.000 to MP 1.473, Anderson County

KY 151 Rural section: from MP 1.473 in Anderson County to MP 2.3 in Franklin County

I. Pavement Condition Evaluation

KYTC Division of Maintenance's Pavement and Operations Management Branch conducted a Pavement Condition Evaluation on KY 151 in July 2014 in accordance with KYTC procedures. The KY 151 pavement was evaluated from US 127 to the Anderson/Franklin County line and continued to Crab Orchard Road (MP 2.534) in Franklin County **(Appendix E)**. The review involved investigation of current pavement conditions as well as historical construction data and prior pavement condition assessments. The Pavement Condition Evaluation included an assessment of fatigue cracking, raveling, and other physical conditions as shown below in **Table 19** (procedures are explained in **Appendix E).**

Table 19 - Summary of Pavement Condition Evaluation (2014)

COUNTY	Anderson	Franklin	Basis for Points[a]
MILEPOINTS	0-4.587	0-2.411	
CONDITION[a]	Points[b]		
Fatigue Cracking	0	0	Extent : Few 0-3 Points *Less than 20% of potential cracking areas show distress, Use a maximum of four potential cracking areas per section* Severity: Slight 0-3 Points *Cracks are less than ¼" in width, No adjacent hairline cracking*
Raveling	0	0	Extent: Few 0-1 Points *½ or more of the section shows slight raveling –or- 1/3 or more of the section has a combination of slight and moderate raveling* *No severe raveling is present* Severity: Slight 0-1 Points *Slight loss of aggregate or binder, Small amounts of pitting* *Pavement appears slightly aged or rough*
Other Cracking	0	0	Extent: Few 0-1 *Points Transverse cracks are spaced at 150' Less than 20% of the section length shows longitudinal cracking* Severity: Slight 0-1 Points *Cracks are less than ¼" in width*
Out of Section	0	3.5	Anderson County pavement scored "0" points for extent and severity, Franklin County pavement scored 2.5 for extent and 1.0 point for severity. For point explanation, see **page 12 of Appendix E.**
Joint Separation	0	0	Extent: Few 0 Points *Less than 20% of the section length shows longitudinal cracking.* Severity: Slight 0-1 Points *Cracks are less than ¼" in width.*
Rideability (IRI)	12	10	Adjusted IRI (92 in Anderson County, 86 in Franklin County)
Rutting	0	0	Rutting less than 1/4" will not be assigned any points. See **Appendix E** for explanation of points assigned.

- *Points for the first five conditions are a combination of extent and severity*
- [a] *Pavement Surface Conditions are explained in more detail in **Appendix E** (Pavement Management in Kentucky, An Overview in Year 2014, KYTC Division of Maintenance)*
- [b] *see **Appendix E***

Pavement Assessment Summary

The Pavement Condition Evaluations show that the Rideability or IRI (92 in Anderson County, 86 in Franklin County shown in **Table 19, p.29**) is in the range that would be considered "fair." In general, the IRI classification used by KYTC is: Good 0-80, Fair 81-150, and Poor 151+.

Since the 2014 inspection, minor localized spots of asphalt pavement mat tearing and shoulder failure caused by the turning movements of garbage trucks were noted in the southbound right turn lane in close proximity to the landfill in Franklin County. This type of distress is considered a materials application related failure.

Asphalt mat tearing

Shoulder failure

KY 151 is classified as an "AAA" roadway. The "AAA" designation indicates the pavement on KY 151 is structurally able to accommodate 80,000 pounds gross weight. Analysis of the overall pavement ride quality (IRI) and visual inspection of the pavement condition showed only minor localized spots of abnormal distress patterns due to materials failure combined with truck traffic as noted above. As such, the pavement structure for KY 151 is considered sufficient to accommodate the existing "AAA" truck weight classification. The physical condition of the roadway falls within normal performance for a pavement within the normal resurfacing cycle.

The construction history for KY 151 within the project limits is:

- (2001) 1.25" CL2 0.38B PG76-22 thin asphalt overlay
- (2013) 1.25" CL3 0.38B PG 64-22 thin asphalt overlay

A typical resurfacing cycle is between 10 and 12 years. KY 151 is anticipated to need an overlay in 2025 to 2026.

J. Road Safety Audit

A Road Safety Audit (RSA) is a formal safety performance examination of an existing roadway by a multidisciplinary team. The RSA team performs a field review, reports on potential road safety issues, and identifies opportunities for improvements in safety for all roadway users.

An RSA was conducted on the KY 151 study corridor on May 10, 2016, with members from the KYTC District 7 Office and the KYTC Central Office, representing the Divisions of Highway Design, Traffic Operations, Permits,

and the Highway Safety Improvement Program. The purpose of the audit was to answer the following questions:

- What elements of the road present a potential safety concern
- What opportunities exist to eliminate or mitigate the identified safety concerns

The RSA Team noted the existing conditions along the corridor including:

- Typical roadway sections, driving lanes, shoulders, superelevation, and cross slopes
- Centerline and edgeline rumble strips
- Speed limits and speed limit changes
- Roadway signage and striping

The RSA report, included in **Appendix F**, details improvement recommendations as follows:

- Mow slopes and cut tree canopies along the roadway in needed areas
- Remove dead trees inside the corridor right-of-way
- In Anderson County, fill in the low shoulder areas
- In Franklin County, repair the localized distressed pavement and shoulder areas, and fill in any low shoulders in the southbound right turn only lane in proximity to the landfill
- Contact the landfill to consider
    - combining the two landfill entrances into one single entrance
    - installing or improving the truck wash system to prevent dust from tracking onto the roadway
- Update corridor signing to 2009 MUTCD standards
- Re-evaluate passing zones and speed limit zones
- Improve the roadway typical section within the 55 mph and 45 mph zones to match the typical section in Franklin County (12-foot driving lanes, 2-foot paved shoulders, and 8-foot earth shoulders)
- Correct the superelevation and curve transitions throughout the corridor
- Landfill entrance: adjust the lane taper to a lane-drop with additional pavement resurfacing and striping

3. Conclusions

Safety is a high priority with KYTC, as documented in KYTC's Mission statement:

> *"To provide a safe, efficient, environmentally sound and fiscally responsible transportation system that delivers economic opportunity and enhances the quality of life in Kentucky."*

As part of the Strategic Plan, KYTC's goals and objectives are to make well-informed, data-driven decisions to reduce the number and severity of motor vehicle crashes. This must be accomplished while also considering the local citizens' concerns, promoting economic development through improving freight movement, and managing limited transportation funds responsibly.

The KY 151 Safety Study evaluated the existing roadway characteristics, traffic volumes, roadway geometrics, speeds, crashes, and pavement conditions. The analysis shows the KY 151 corridor between US 127 and I-64 has a better safety record than Kentucky roadways of similar functional classification in both rural and urban areas. The analysis also suggests roadway capacity is not an issue, the existing traffic control devices are within industry guidelines, the posted speed limits are appropriate, the pavement conditions are fair, the roadway geometrics, although not up to current industry guidelines, are not contributing to crash rates higher than would

be expected due to random occurrence, and there are no apparent all-vehicle type crash patterns indicating the roadway geometry is insufficient along the corridor.

The CMV-specific data and physical evidence were examined along the KY 151 corridor. The analysis and physical evidence indicate some of the CMV crashes may be related to offtracking and shoulder drop-offs at two curves located at MP 2.6 and MP 3.0, and the abrupt change in pavement width at MP 4.1 in Anderson County.

Although the analysis indicates STAA vehicles may have difficulty tracking within their 11-foot travel lanes at two of the curves in Anderson County, it does not necessarily indicate that the STAA vehicles must be removed from the KY 151 corridor. However, because of the proximity of US 127 as a viable alternate route and with the possibility of the roadway geometric conditions contributing to the CMV crashes, the Official Order prohibiting STAA vehicles was an appropriate action to balance the concerns of the local residents, government officials, and commercial vehicle traffic. A further ban on all CMVs, or trucks over three axles as requested by the civil action lawsuit is not supported by the analysis and would unjustifiably restrict freight movement.

While the crash analysis indicates the crashes along the corridor are likely occurring in a statistically random manner and are generally of lower severity than statewide averages, the overall evaluations indicate the CMV-related issues at MPs 2.6, 3.0, and 4.1 in Anderson County have the potential to be mitigated by a combination of improving the shoulders in the section of roadway between the community of Alton and the Anderson and Franklin County line, along with continuing to restrict the STAA vehicles. The STAA restriction reduced the overall percentage of CMVs on the study corridor by nearly half, thereby reducing the potential for CMV crashes along KY 151. Additional improvements to enhance safety along the corridor are listed in the Road Safety Audit section of this study. To address the initial findings of this study and improve safety along the corridor, the shoulders have been widened on the section of KY 151 between the community of Alton and the change in pavement width at MP 4.1.

Appendix A

Map of KY Designated National Truck Network

Project Identification Form (PIF)

Federal Register Notice by FHWA

Official Order 110134

KENTUCKY DESIGNATED NATIONAL TRUCK NETWORK (NN)

(For use by increased dimension or STAA trucks)

A listing of the Designated Network can be obtained at:
http://transportation.ky.gov/Planning/Pages/National-Truck-Network.aspx

or by writing:
Kentucky Transportation Cabinet
Division of Planning
200 Mero St., 5th Floor
Frankfort, KY 40622

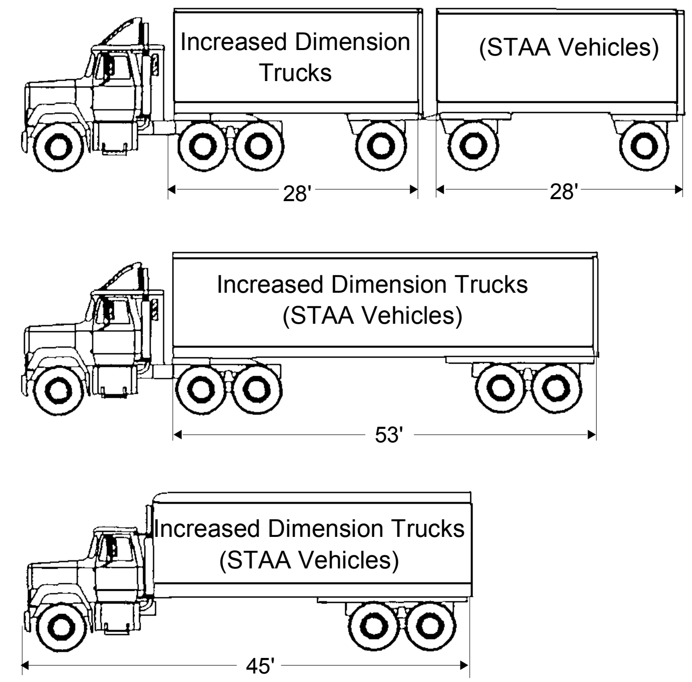
Federal Authorized Route	State Authorized Route
Multilane highway	Multilane highway
Two lane highway	Two lane highway

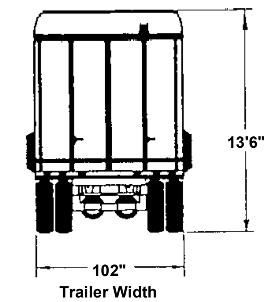
AU	Audubon Parkway
BG	Martha Layne Collins Bluegrass Parkway
LN	Louie B. Nunn Cumberland Parkway
HR	Hal Rogers Parkway
MTN	Bert T. Combs Mountain Parkway
EB	Edward T. Breathitt Pennyrile Parkway
JC	Julian M. Carroll Purchase Parkway
WN	William H. Natcher Parkway
WK	Wendell H. Ford Western Kentucky Parkway

In compliance with the Surface Transportation Assistance Act of 1982 (STAA) and DOT Appropriations Act of 1983 and KRS 189.222, Kentucky has established a network of highways on which motor vehicles with increased dimensions (STAA vehicles) may operate.

Motor vehicles with these increased dimensions shall be allowed on state-maintained highways five (5) driving miles from the designated system and fifteen (15) miles from an interstate or parkway exit for the purpose of attaining reasonable access to terminals, facilities for food, fuel, repairs, or rest. The allowed access is reduced to one (1) driving mile from the designated system on public use highways which are not state-maintained.

Latest Kentucky Designated National Truck Network Revision: 4/29/2016

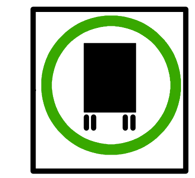




Increased Dimension Trucks
(STAA Vehicles)

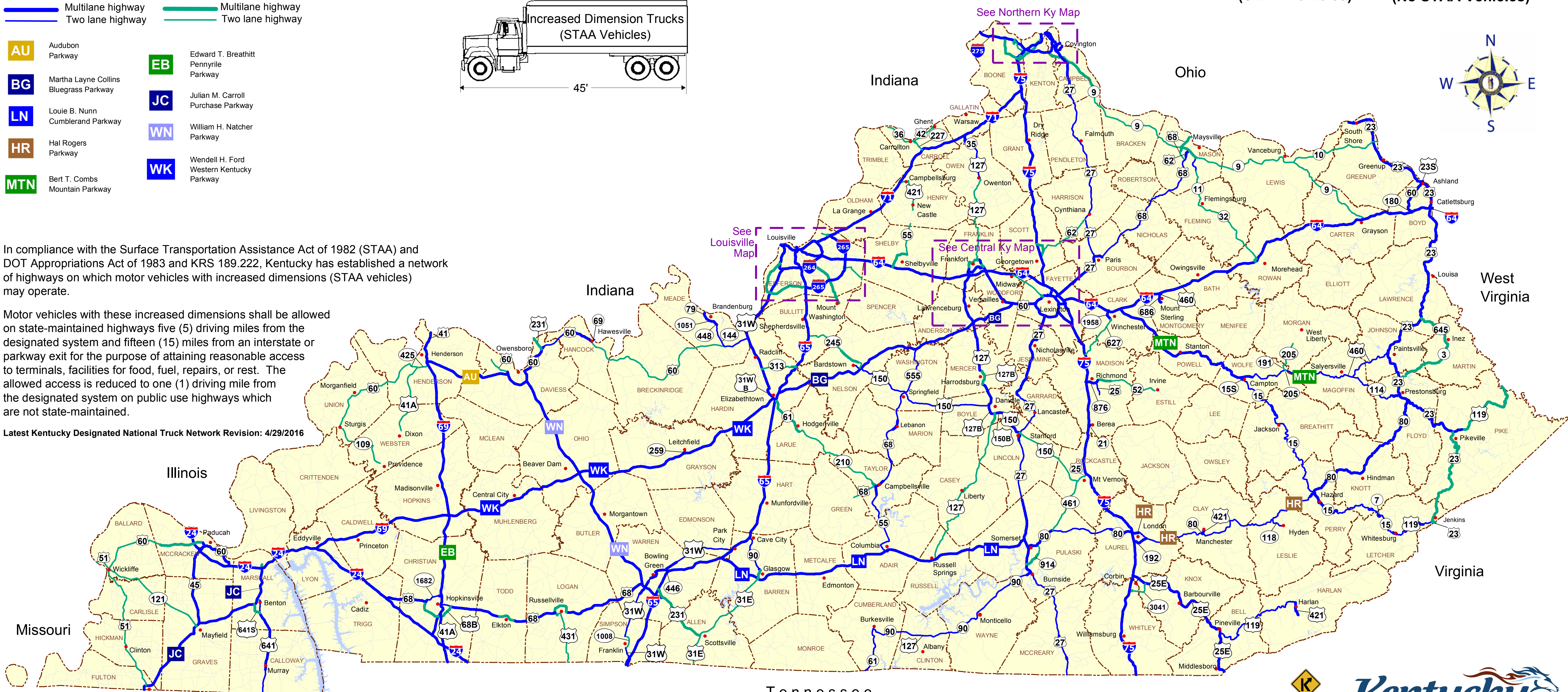
Weight
Single axle weight: 20,000 pounds
Tandem axle weight: 34,000 pounds
Gross vehicle weight : 80,000 pounds
Compliance with the Federal Bridge Formula

National Truck Network (NN) Signs



Designated Truck Network Route (STAA Vehicles)

Increased Dimension Trucks Prohibited (No STAA Vehicles)



Division of Planning

Kentucky UNBRIDLED SPIRIT

PIF - Control Number: 07 003 D0151 1.00

General Info

Requestor Name:		Status:	Active
Requestor Title:		Mode:	Highways
Requested By Date:	8/11/2008 12:00:00 AM	Type:	Major widening
Form Completed By:	B. Duncan / R. Turner	ADD:	BLUEGRASS
Title / Organization:	BGADD / KYTCD7	MPO:	
Form Completed Date:	6/21/2010 12:00:00 AM	Urban Area:	Rural
District:	7	Parent Control No:	07 003 D0151 1.00
County:	Anderson	RSE Unique No:	003-KY-0151 -000
Prefix:	KY	State System:	
Route No:	151		
Route Type:	D		
Suffix:		Functional System:	
BMP:	0.000		
EMP:	4.587		

BMP	EMP	SPRS
0	4.5870	State Primary (Other)

BMP	EMP	FC
0	1.4730	Urban Minor Arterial Street
1.4730	4.5870	Rural Minor Arterial

Length:	6.728
Existing Studies:	NONE
Purpose Statement:	Reconstruct KY 151 from US 127 in Anderson County to I-64 in Franklin County.
Regional Goal:	To promote the safe and efficient movement of people, goods, and services to benefit all of the residents of the region.
Last Updated By:	bret.blair
Last Updated Date:	6/29/2015 10:36:51 AM

Highway Network:

Non NHS:	True	NHS:	False	NN:	False	Scenic Way:	False
Coal Haul:	False	Bike:	False	Forest:	False	Strahnet:	False
Ext Weight:	False	ADHS:	False				

ROW

Average Width:

Source:

HIS:	False	Plans:	False	Microfilm:	False
Other:	False				

Current Primary Use:

Industrial:	False	Commercial:	False	Residential:	True	Farmland:	True
Other:	False						

Project may require additional R/W: True

Possible Number of Relocations:

Homes: 0 Businesses: 0

Comments: Number undermined

Utilities

Existing Utilities:

Electrical:	True	Gas:	True	Telephone:	True	Cable:	True
Sewer:	True	Water:	True	ITS:	False	None:	False
Other:	False						

Project may require Utility Relocations: True

Comments:

Economic Impact

Planning / Zoning Reg exist in Community: True

Project may affect established Business, Commercial, or Industrial districts: False

Economic impacts on regional / local economy: True

Development:	True	Tax Revenues:	True	Emp Opportunity:	False
Retail Sales:	False	Other:	True		

Comments: Access to I-64 for trucks and access to National Truck Network

Direct access to major points of interest: False

Nat'l / St Parks:	False	Monuments:	False	Amusement Parks:	False
Historic Sites:	False	US Public Land:	False	Other:	False

Comments:

Direct access to major traffic generators: True

Shopping Centers:	False	Schools:	False	Industries:	False
Military Installations:	False	Other:	True		

Comments: Benson Valley Landfill in Franklin County

Multimodal

This Project is a Candidate for:

Bicycle Paths:	False	Sidewalks:	False	Shared-Use Paths:	False
Park / Ride Lots:	False	N/A	True		

Project Improves Direct Access to:

Airports:	False	Railways:	False	Riverports:	False
Trucking Routes:	True	N/A	False		

Type of Public Transportation Available:

Fixed Routes: False Demand Response: True

Comments:

Social Impact

This Project May affect:

Neighborhood / Community Cohesion:	False
Travel Patterns (vehicular, commuter, bicycle, pedestrian):	False
Household relocations:	False
Elderly, disabled, nondrivers, minorities, low-income persons:	False
No adverse effects to neighborhoods apparent:	True

Comments:

Environmental Impact

Environmental Impact:

Blue Line Streams:	True	Wetlands:	False	Floodplain:	False
Wildlife Managed Areas:	False	Historic Properties:	False	Cemeteries:	False
Schools:	False	Churches:	True	Endangered Species:	False
Public Land / Park:	False	Noise Impact:	False	Arch. Sites:	False
NR Properties:	False	Potential NR Properties:	False		

Other:

Potential Contaminated Sites:

Gas Stations: True Landfills: False Auto Repair: False

Junkyards: False

Other:

Comments:

Air Quality

Maintenance or Nonattainment Area: False Ozone: False PM: False

Adds through Lane Capacity: True

Congestion Management Plan: False

Project is included in TIP/STIP: False

Comments:

Cost Estimate

PIF #: 07 003 D0151 1.00

Revision #: 4

BMP: 0.000

EMP: 4.587

Last Updated By: bret.blair

Last Updated Date: 8/3/2015 3:29:58 PM

Estimate Class: Ranking Process Per Mile: False

Terrain:

BMP	EMP	Terrain
0	0.4770	Flat
0.4770	1.4730	Flat
1.4730	4.1750	Flat
4.1750	4.5870	Flat

Detailed Estimate with Calculations Attached: False

Estimate Assumptions:

Planning:

SCH YEAR	SCH FUND	PLAN YEAR	ITEMNO

Design:

SCH YEAR	SCH FUND	PLAN YEAR	ITEMNO
2016			

Right of Way:

SCH YEAR	SCH FUND	PLAN YEAR	ITEMNO
2018			

Utilities:

SCH YEAR	SCH FUND	PLAN YEAR	ITEMNO
2018			

Construction:

SCH YEAR	SCH FUND	PLAN YEAR	ITEMNO
2018			

Original Estimate:

Planning:	$0.00
Design:	$1,750,000.00
Right of Way:	$5,000,000.00
Utilities:	$5,000,000.00
Construction:	$20,000,000.00
Total Cost:	$31,750,000.00

Estimate Procedure Used:

Attachments:

Location Map: False Photograph(s): False Others: Sheet showing Cost Estimate: False

Comments:

Highway ATT

PIF #: 07 003 D0151 1.00

BMP: 0.000

EMP:	4.587
Last Updated By:	bret.blair
Last Updated Date:	7/8/2015 10:10:43 AM
Needs Statement:	

Adequacy Rating Range

	From:	To:
Adequacy Rating:	85.50	93
CRF:	0.4680	0.8950
IRI:	85	194
V/SF:	0.24	0.34
ADT:	(YR - 2013) - 4588	(YR - 2014) - 7153
% Trucks (Single):	5.5580	5.5580
% Trucks (Combination):	6.5640	6.5640
Speed Limit:	35	55

ProjectedADT (HDO)/Year:	Coming Soon	% Growth:	Coming Soon	ProjectedADT:	Coming Soon

Miscellaneous Roadway Conditions

Access Control:	

BMP	EMP	Type
0	0.4770	Partial
0.4770	4.5870	By Permit

Proposed Access Control: Partial

Lane Width:

BMP	EMP	WIDTH	LANES
0.4770	4.1750	11	2
0	0.4770	12	2
4.1750	4.5870	12	2

Proposed Lane Width: 12

Proposed Lanes: 2

MedianType:

BMP	EMP	WIDTH	TYPE
0	4.5870	0	None

Proposed Median Type: None

Proposed Median Width: 0

Shoulders:

BMP	EMP	WIDTH	TYPE	X SECT
0	0.4770	10	Paved w/ Bituminous Material	CR
0	0.4770	10	Paved w/ Bituminous Material	NR
0.4770	4.16	4	Combination	CR
0.4770	4.16	4	Combination	NR
4.16	4.51	9	Paved w/ Bituminous Material	CR
4.16	4.51	9	Paved w/ Bituminous Material	NR
4.51	4.5870	10	Combination	CR
4.51	4.5870	10	Combination	NR

Proposed Shoulder Type: Paved w/ Bituminous Material

Proposed Shoulder Width: 8

No. of Bridges: 0

Traffic Loop: Coming Soon

Other Improvement Projects in Area:

None: True SYP: False Resurface: False Others: False

Comments:

PIF Status

Status History:

Status Type	Status Updated Date	Status Updated By
Active	2/22/2010 10:48:34 AM	sowjanya.buruugpalli
Active	6/21/2010 1:33:43 PM	bruce.duncan
Active	10/18/2011 10:27:41 AM	ricky.sizemore
Active	10/27/2011 1:32:40 PM	ricky.sizemore
Active	10/27/2011 3:49:56 PM	Ricky.Sizemore
Active	8/9/2013 2:22:44 PM	ricky.sizemore
Active	6/29/2015 10:36:51 AM	bret.blair

Ranking

Rank Type	Year	Priority	Rank	Tier Rank	Overall	Updated By	Updated Date
LOCAL	2001	HIGH	0			sowjanya.burugupalli	3/10/2010 12:53:50 PM
REGIONAL	2001	HIGH	0			sowjanya.burugupalli	3/10/2010 12:54:17 PM
DISTRICT	2001	MEDIUM	0			sowjanya.burugupalli	3/10/2010 12:55:15 PM
LOCAL	2003	MEDIUM	0	3		sowjanya.burugupalli	3/10/2010 2:10:17 PM
REGIONAL	2003	MEDIUM	0	3		sowjanya.burugupalli	3/10/2010 2:26:12 PM
DISTRICT	2003	MEDIUM	0	3		sowjanya.burugupalli	3/10/2010 2:29:01 PM
LOCAL	2005	HIGH	0			sowjanya.burugupalli	4/5/2010 11:21:25 AM
REGIONAL	2005	HIGH	0			sowjanya.burugupalli	4/5/2010 11:27:35 AM
DISTRICT	2005	MEDIUM	0			sowjanya.burugupalli	4/5/2010 12:37:55 PM
LOCAL	2007	NONE	1			sowjanya.burugupalli	4/5/2010 1:15:00 PM

REGIONAL	2007	HIGH	4				sowjanya.burugupalli	4/5/2010 1:29:02 PM
DISTRICT	2007	HIGH	24				sowjanya.burugupalli	4/5/2010 1:37:38 PM
LOCAL	2009	NONE	1				sowjanya.burugupalli	4/5/2010 4:29:45 PM
REGIONAL	2009	HIGH	5				sowjanya.burugupalli	4/5/2010 4:30:32 PM
DISTRICT	2009	HIGH	19				sowjanya.burugupalli	4/5/2010 4:31:01 PM
REGIONAL	2009	HIGH	5	3		5	bruce.duncan	8/30/2010 8:30:11 AM
REGIONAL	2011	HIGH	6	3		6	bruce.duncan	6/22/2011 8:31:56 AM
DISTRICT	2011	HIGH	7	3		7	ricky.sizemore	5/21/2013 11:31:06 AM
REGIONAL	2013	NONE	5			5	chris.chaney	7/31/2013 10:38:35 AM
REGIONAL	2013	NONE	5	3			chris.chaney	7/31/2013 10:38:59 AM
LOCAL	2013	NONE	1				chris.chaney	7/31/2013 10:39:20 AM
DISTRICT	2013	NONE	5				dal.harper	8/8/2013 3:25:33 PM
DISTRICT	2013	NONE	4	3		5	ricky.sizemore	8/9/2013 2:23:54 PM
LOCAL	2015	NONE				2	chris.chaney	3/20/2015 8:39:06 AM
STATE	2015	NONE	42				ETLUSER	5/4/2015 3:33:06 PM
REGIONAL	2015	NONE				28	chris.chaney	5/22/2015 12:32:58 PM
DISTRICT	2015	NONE				14	bret.blair	7/8/2015 10:09:34 AM

and the port(s) at which they are interested in filing the appropriate PGA Message Set and DIS information. Requests to participate in this test will be accepted throughout the duration of the test without limitation as to number of participants. To be eligible for this pilot, the applicant must be a self-filing importer who has the ability to file ACE Entry Summaries certified for cargo release and ACE cargo release or a broker who has the ability to file ACE Entry Summaries certified for cargo release and ACE cargo release; and the applicant files entries for shrimp or shrimp products. All PGA Message Set participants are required to use a software program that has completed ACE certification testing for the PGA Message Set. The PGA Message Set data and DIS submissions are not limited by entry type except by the ACE Mandatory Use Dates which can be found at *https://www.cbp.gov/trade/automated/ace-mandatory-use-dates.*

VI. Anticipated Process Changes

The current paper process for the DS–2031 will eventually be replaced by the submittal of data and scanned document images through a combination of the PGA Message Set and DIS. This test covers communication and coordination among the agencies and those who file the DS–2031 for the importation of shrimp and shrimp products. The agencies will also be testing new operational processes in real time with actual ACE filings in the production environment that include test messages of errors in filing and release status updates to the port and to the filer. Entry data submissions will be subject to validation edits and any applicable PGA business rules programmed into ACE. Once entry data has cleared the initial stage of validation edits and PGA business rules, the filer will receive messages, automatically generated or manually initiated by, thus keeping the filer informed as to the status of the shipment from the time of entry data submission until the time of release. Once all of the PGAs have concluded their review of the shipment and have unset any remaining holds, CBP will send one U.S. government release message to the filer to indicate that the filer has fulfilled all U.S. government filing requirements for the shipment.

VII. Confidentiality

All data submitted and entered into ACE is subject to the Trade Secrets Act (18 U.S.C. 1905) and is considered confidential, except to the extent as otherwise provided by law. As stated in previous notices, participation in this or any of the previous ACE tests is not confidential and the name(s) of an approved participant(s) may be disclosed by CBP.

Dated: June 9, 2016.

William Gibbons-Fly,

Director, Office of Marine Conservation, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State.

[FR Doc. 2016–14184 Filed 6–14–16; 8:45 am]

BILLING CODE 4710–09–P

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

[Docket No. FHWA–2016–0012]

Emergency Deletion of National Network Route—Kentucky Route 151

AGENCY: Federal Highway Administration (FHWA), Department of Transportation (DOT).

ACTION: Notice; request for comments.

SUMMARY: This notice requests comments on the emergency deletion of Kentucky Route 151 (KY 151) (from US 127 north of Lawrenceburg, KY to Interstate 64 (I–64) Exit 48) from the National Network (NN) based on safety considerations related to numerous truck accidents and route geometric deficiencies. On April 26, 2016, FHWA approved the emergency deletion of KY 151 (from U.S. 127 north of Lawrenceburg to I–64 Exit 48), from the NN based on safety considerations. The deletion is not final and FHWA seeks public comments and information to assist in assessing its impacts.

DATES: Comments must be received on or before July 15, 2016.

ADDRESSES: To ensure that you do not duplicate your docket submissions, please submit them by only one of the following means:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov* and follow the online instructions for submitting comments.
- *Mail:* Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue SE., W12–140, Washington, DC 20590–0001.
- *Hand Delivery:* West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue SE., between 9 a.m. and 5 p.m., e.t., Monday through Friday, except Federal holidays. The telephone number is 202–366–9329.
- *Instructions:* You must include the agency name and docket number at the beginning of your comments. All comments received will be posted without change to *http://www.regulations.gov,* including any personal information provided.

FOR FURTHER INFORMATION CONTACT: For questions about the deletion from the NN, contact Crystal Jones, FHWA Office of Freight Management and Operations, telephone at 202–366–2976, or via email at *Crystal.Jones@dot.gov.* For legal questions, please contact William Winne, FHWA Office of the Chief Counsel, telephone at 202–366–1397, or via email at *William.Winne@dot.gov.* Business hours for the FHWA are from 8:00 a.m. to 4:30 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:

Electronic Access

You may retrieve a copy of the notice through the Federal eRulemaking portal at *http://www.regulations.gov.* The Web site is available 24 hours each day, 365 days each year. Electronic submission and retrieval help and guidelines are available under the help section of the Web site. An electronic copy of this document may also be downloaded from Office of the Federal Register's Web site at *http://www.archives.gov/federal_register* and the Government Printing Office's Web page at *http://www.gpoaccess.gov.*

Background

The NN was authorized by the Surface Transportation Assistance Act of 1982 (STAA) (Pub. L. 97–424). Title 23 CFR 658 requires States to allow conventional large truck combinations on designated roadways that link principal cities and densely developed areas of the States. Conventional large truck combinations are tractors with one semitrailer of 48 feet in length or one 28-foot semitrailer and one 28-foot trailer, both of which can be up to 102 inches wide.

Even though the geography of interstate commerce has changed significantly with the growth of smaller communities into principle cities and the emergence of new densely developed areas, the NN has not changed significantly in a quarter century. The definition of conventional large truck combinations has also not changed, although 53-feet instead of 48-feet is the prevalent length of a single trailer and is allowed in most States.

The STAA acknowledged that the NN might need to be changed over time. Accordingly, FHWA developed regulations on the procedures for additions, deletions, and use restrictions. Title 23 CFR 658.11(e) provided for emergency deletions of any route from the NN for safety considerations. Emergency deletions are not considered final, and must be published in the **Federal Register** for notice and comment.

Conventional large truck combinations often use KY 151 as a shortcut from I–64 Exit 48 to connect with four-lane divided U.S. 127 north of Lawrenceburg, KY. A recent series of large truck crashes have raised concerns on the appropriateness of its designation as an NN route. The predominant type of crash involves trucks veering off the roadway where the roadway and shoulders are too narrow for conventional combination large trucks. The route has experienced an increasingly high rate of single vehicle truck accidents. It has marginal lane widths (11 to 12 foot) and shoulder widths (1 to 2 foot) and includes sections with horizontal curvature that negatively impact sight distances and safe operation of combination truck and bus vehicle traffic. The current traffic volume on the nearby alternate route (U.S. 127) is approximately 18,000 average annual daily traffic (AADT). Based on traffic data available, FHWA expects that truck traffic on U.S. 127 will increase from 1,260 to 1,694 AADT per day, that is, approximately 434 trucks per day. The percentage of trucks on U.S. 127 would increase from about 7 to 9 percent trucks.

Vehicle collision data gathered from the Kentucky State Police show that KY 151 experienced single vehicle accidents involving large trucks and buses six times more often than U.S. 127 (the alternate route), during the same time period. Further analysis shows that half of the accidents on KY 151 are ''Ran Off Roadway (One Vehicle With/Earth Embankment/Ditch)'' collisions, while U.S. 127 did not experience a single accident of this type during the same reporting period (2010–2015). The U.S. 127 is a four-lane divided partially controlled access highway with 12-foot lanes, 10-foot paved outside shoulders, 4-foot paved inside shoulders, and a 40-foot median.

Purpose of the Notice

The purpose of this notice is to request comments on the deletion of KY 151 (from U.S. 127 north of Lawrenceburg to I–64 Exit 48) from the NN. To ensure that the NN remains substantially intact, FHWA retains the authority to rule upon all requested additions to, and deletions from, the NN. This authority includes emergency deletions based on safety considerations (23 CFR 658.11(e)). On April 26, 2016, FHWA approved the emergency deletion of KY 151 from I–64 to U.S. 127 (near Lawrenceburg, KY) from the NN based on safety considerations. This deletion is not final and FHWA seeks public comments to assist in assessing its impacts.

Comments are requested on the following matters and any others relating to the deletion of the route from the NN:

- Will the deletion of the route negatively impact the flow of interstate commerce?
- Are there safety issues with the route, particularly as it relates to operation of conventional combination large trucks that are generally tractors with one semitrailer up to 48 feet in length, or one 28-foot semitrailer and one 28-foot trailer, and up to 102 inches wide?
- What is the safety record of the route, including current or anticipated safety problems?
- Is the route experiencing above normal accident rates and/or accident severities?
- Is there information available that indicates that the accident problems on the route are aggravated by larger conventional trucks?
- What are the geometric, structural, or traffic operations features that might preclude safe and efficient operation of large conventional trucks (*e.g.,* lane widths, sight distance, severity and length of grades, horizontal curvature, shoulder width, narrow bridges, bridge clearances and load limits, traffic volumes and vehicle mix, intersection geometrics, and vulnerability of roadside property)? (*Pictures or illustrations would be helpful.*)
- Are there operational restrictions that might be implemented in lieu of deletion of the route from the NN?
- Are there locations on the route that large trucks require access to such as terminals and facilities for food, fuel, repairs, and rest?
- Is U.S. 127 a reasonable alternate route?
- Are there safety concerns with the use of U.S. 127 as alternate route. (*Pictures or illustrations would be helpful.*)

Authority: 49 U.S.C. 31111–31114; Sections 411 and 412 of the Surface Transportation Assistance Act of 1982 (Pub. L. 97–424).

Issued on: June 1, 2016.

Gregory G. Nadeau,

Administrator, Federal Highway Administration.

[FR Doc. 2016–14129 Filed 6–14–16; 8:45 am]

BILLING CODE 4910–22–P

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Buy America Waiver Notification

AGENCY: Federal Highway Administration (FHWA), Department of Transportation (DOT).

ACTION: Notice.

SUMMARY: This notice provides information regarding FHWA's finding that a Buy America waiver is appropriate for the re-use of historical U.S. 40 steel bridge truss members for construction of a bicycle and pedestrian bridge over Little Blue River in the City of Grandview in the State of Missouri.

DATES: The effective date of the waiver is June 16, 2016.

FOR FURTHER INFORMATION CONTACT: For questions about this notice, please contact Mr. Gerald Yakowenko, FHWA Office of Program Administration, 202–366–1562, or via email at *gerald.yakowenko@dot.gov.* For legal questions, please contact Ms. Jennifer Mayo, FHWA Office of the Chief Counsel, 202–366–1523, or via email at *jennifer.mayo@dot.gov.* Office hours for the FHWA are from 8:00 a.m. to 4:30 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:

Electronic Access

An electronic copy of this document may be downloaded from the **Federal Register**'s home page at *http://www.archives.gov* and the Government Printing Office's database at *http://www.access.gpo.gov/nara.*

Background

The FHWA's Buy America policy in 23 CFR 635.410 requires a domestic manufacturing process for any steel or iron products (including protective coatings) that are permanently incorporated in a Federal-aid construction project. The regulation also provides for a waiver of the Buy America requirements when the application would be inconsistent with the public interest or when satisfactory quality domestic steel and iron products are not sufficiently available. This notice provides information regarding FHWA's finding that a Buy America waiver is appropriate for the re-use of historical U.S. 40 steel bridge truss members in construction of bicycle and pedestrian bridge over Little Blue River in Grandview, MO.

In accordance with Division K, section 122 of the Consolidated and Further Continuing Appropriations Act of 2015 (Pub. L. 113–235), FHWA

Matthew G. Bevin
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.transportation.ky.gov/

Greg Thomas
Secretary

OFFICIAL ORDER: 110134

SUBJECT: Kentucky National Truck Network
Anderson & Franklin Counties
KY 151

Pursuant to the provisions of KRS 189.222 and KRS 189.231 and in accordance with 23 C.F.R § 658.11(e), it is hereby directed that KY 151 in Anderson County and Franklin County be removed from the Kentucky National Truck Network (NN). The KY 151 roadway is described as follows:

> KY 151, from the junction with US 127 north of Lawrenceburg, via Alton, to the Franklin County Line, a distance of 4.587 miles. (MP 0.000 to MP 4.587)
>
> KY 151, from the Anderson County Line to the junction with the I-64 interchange, a distance of 2.141 miles. (MP 0.000 to MP 2.141)

The removal of this route from the Kentucky National Truck Network is justified because Interstate 64 (I-64) and United States Highway 127 (U.S. 127) provide a safer route for vehicles with 102-inch wide trailers while further promoting safety to the travelling public.

It is further directed that the operation of motor vehicles or a combination of motor vehicles upon the aforementioned route shall not exceed the following dimensions:

(a) Height, thirteen and one-half (13 ½) feet;

(b) Width, ninety six (96) inches, including any part of the body or load;

(c) Length:

1) Semitrailers – sixty-five (65) feet including body and load when operated in a tractor-semitrailer combination.

2) Trailers – forty-eight (48) feet including body and load when operated in a tractor-semitrailer combination, not to exceed one (1) per truck and not operated in a tractor-semitrailer-trailer combination.

3) Single Unit Trucks – forty-five (45) feet including body and load.

Motor vehicles with increased dimensions (102-inch wide trailers) are allowed one (1) driving mile access from the designated NN for the purpose of attaining reasonable access to terminals, facilities for food, fuel, repairs and rest.

Exempted from this Official Order are single unit vehicles designed for and engaged exclusively in the collection and hauling of refuse.

By letter of April 27, 2016, the Federal Highway Administration approved the removal of the above segments of KY 151 from the National Truck Network (NN).

Signed and approved on this the 29th day of April, 2016.

Greg Thomas, Secretary
Kentucky Transportation Cabinet

Approved as to form and legality:

KYTC, Office of Legal Services

Appendix B

Traffic Volumes

Capacity Analysis Details

Kentucky Transportation Cabinet

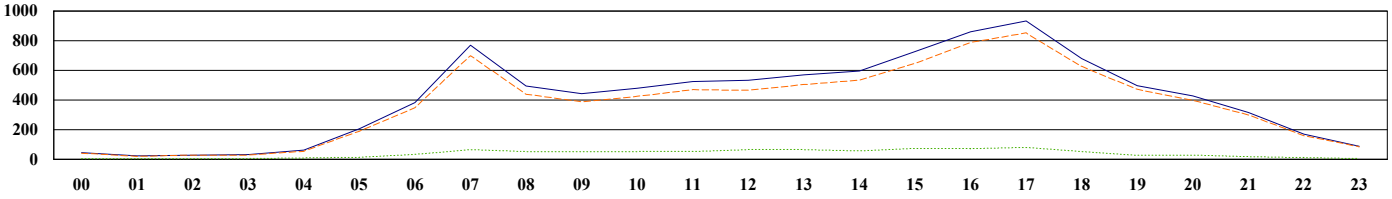
24 Hour Roadway Summary for May 18, 2016

003044, 003-KY-0151 -0000
FC16 **Anderson County**

003-KY-0151 -000 @ .400 From: US 127 AND US 127 BYPASS To: KY 5

	Total	Total	Peak	Peak
Private:	8,940.9	90.5	851.5	91.2
Single:	430.3	4.4	28.7	3.1
Combo:	453.0	4.6	51.7	5.5
Trucks:	883.3	8.9	80.4	8.6
Total:	9,883.6		934.0	

Peak Hour: 17
Axle Factor: 0.94



	VOL	MC	CAR	PU	BUS	2D	SU 3	SU 4+	ST 4-	ST 5	ST 6+	MT 5-	MT 6	MT 7+
0	45.1	0.4	30.2	10.9	0.3	2.0	0.4	0	0	0.9	0	0	0	0
1	23.2	0.4	13.9	4.3	0.3	2.0	0.4	0	0.4	1.4	0	0	0	0
2	28.7	0	22.0	4.9	0	0.4	0	0	0.4	0.9	0	0	0	0
3	32.4	0.4	22.2	4.9	0.4	2.0	1.2	0	0	1.3	0	0	0	0
4	61.5	0.7	32.7	19.5	0.7	2.0	0.8	0	0	5.1	0	0	0	0
5	205.5	0.4	138.4	50.6	2.4	8.4	3.6	0.4	0.9	0.5	0	0	0	0
6	382.2	0	242.5	103.8	3.8	17.2	0.4	0.8	6.4	6.3	0.9	0	0	0
7	769.6	2.2	516.3	181.0	5.5	22.4	4.8	1.6	24.7	7.6	3.1	0	0	0.4
8	494.1	1.5	309.4	128.7	2.5	21.2	5.6	2.4	12.5	8.1	2.2	0	0	0
9	442.1	2.9	261.9	122.9	4.5	17.2	6.8	2.0	11.6	10.9	1.4	0	0	0
10	478.9	1.8	290.6	130.9	4.1	14.4	5.2	4.4	13.5	12.2	1.4	0	0	0.5
11	524.1	2.9	339.9	125.1	4.5	18.8	6.8	0.8	14.0	9.0	0.9	0.9	0	0.5
12	533.6	3.4	342.6	118.0	5.2	22.9	4.5	4.9	18.8	6.8	4.1	1.3	0	1.1
13	569.7	3.0	355.1	144.7	3.5	25.1	5.6	0.4	16.4	10.0	2.8	1.9	0	1.1
14	595.1	6.5	383.2	144.5	4.9	22.2	5.4	2.4	15.0	7.9	2.1	0.4	0	0.4
15	726.5	5.3	459.9	180.6	7.0	21.4	9.3	2.8	29.9	5.8	3.0	1.5	0	0
16	860.8	2.6	584.4	199.2	4.2	25.5	4.4	2.0	26.1	7.1	3.9	1.1	0	0.4
17	934.0	4.9	649.4	197.2	2.1	21.0	4.9	2.8	40.0	9.2	1.5	1.1	0	0
18	679.4	1.5	469.6	154.2	1.8	15.2	2.8	0.8	25.2	7.3	0.6	0.4	0	0
19	495.7	4.3	355.5	111.0	0	12.4	2.1	0.4	8.3	1.7	0	0	0	0
20	427.1	2.7	291.7	103.4	1.1	13.1	1.6	0.4	7.0	4.9	1.3	0	0	0
21	316.7	1.5	218.3	78.9	0	10.2	0.4	0.4	5.2	1.7	0	0	0	0
22	169.6	0.8	113.7	43.9	0.7	2.9	0.4	0.4	4.1	2.8	0	0	0	0
23	88.2	0	66.1	18.4	0	2.5	0	0	0.6	0.6	0	0	0	0
Total	**9,883.6**	**50.0**	**6,509.5**	**2,381.5**	**59.3**	**322.3**	**77.6**	**30.3**	**281.0**	**129.9**	**29.2**	**8.6**	**0**	**4.4**
%	**100.0**	**0.5**	**65.9**	**24.1**	**0.6**	**3.3**	**0.8**	**0.3**	**2.8**	**1.3**	**0.3**	**0.1**	**0**	**0**

Kentucky Transportation Cabinet

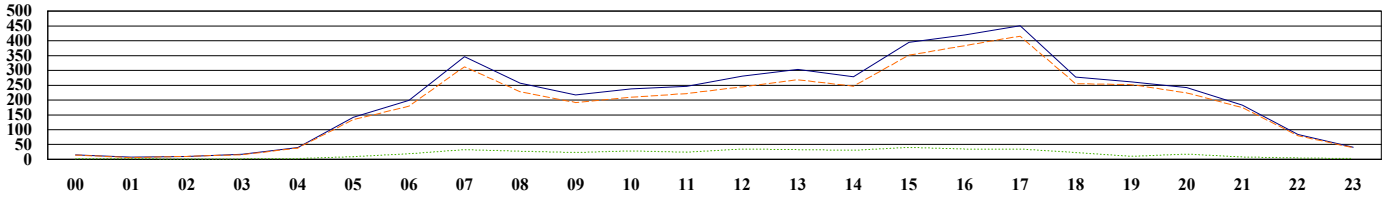
24 Hour Directional Summary, Pos Bound for May 18, 2016

003044, 003-KY-0151 -0000
FC16 **Anderson County**

003-KY-0151 -000 @ .400 From: US 127 AND US 127 BYPASS To: KY 5

	Total	Total	Peak	Peak
Private:	4,484.8	90.6	414.7	92.0
Single:	207.4	4.2	12.3	2.7
Combo:	226.8	4.6	22.2	4.9
Trucks:	434.2	8.8	34.5	7.7
Total:	4,949.2		450.9	

Peak Hour: 17
Axle Factor: 0.94



	VOL	MC	CAR	PU	BUS	2D	SU 3	SU 4+	ST 4-	ST 5	ST 6+	MT 5-	MT 6	MT 7+
0	15.1	0	10.5	3.8	0	0.8	0	0	0	0	0	0	0	0
1	7.5	0	4.8	1.1	0	1.2	0	0	0	0.5	0	0	0	0
2	9.7	0	7.6	1.7	0	0	0	0	0	0.5	0	0	0	0
3	17.1	0.4	11.9	3.3	0	1.6	0	0	0	0	0	0	0	0
4	39.8	0.7	24.6	11.9	0	0.8	0.8	0	0	0.9	0	0	0	0
5	141.7	0	99.3	33.6	0.7	6.8	0	0.4	0.9	0	0	0	0	0
6	199.0	0	130.8	47.8	2.4	11.2	0.4	0	3.2	2.3	0.9	0	0	0
7	346.0	0.4	240.2	71.8	1.4	9.6	3.2	0.8	11.9	3.6	2.7	0	0	0.4
8	256.7	0.4	170.4	57.0	2.1	8.0	2.4	2.4	7.2	5.4	1.3	0	0	0
9	217.4	1.5	131.1	59.3	3.1	9.6	1.6	0.4	6.2	4.6	0	0	0	0
10	237.7	1.5	147.4	59.7	1.0	5.6	2.4	4.4	6.7	7.2	1.4	0	0	0.5
11	246.8	1.1	159.3	61.1	1.7	8.4	2.0	0.4	6.3	4.6	0.4	0.9	0	0.5
12	281.1	2.6	178.9	62.3	2.4	11.1	2.5	4.1	9.0	3.6	3.0	0.6	0	1.1
13	303.2	0.4	197.5	70.0	3.1	13.5	2.1	0	9.6	4.9	1.3	0.4	0	0.4
14	278.1	3.5	179.6	63.0	2.1	10.7	4.1	2.0	8.1	2.8	1.7	0.4	0	0
15	395.0	1.9	265.2	83.8	4.9	9.5	4.5	2.8	17.1	3.4	1.1	0.9	0	0
16	419.0	1.1	288.1	93.5	2.1	10.6	1.2	2.0	12.4	5.8	2.1	0	0	0
17	450.9	3.0	317.3	94.3	1.8	8.2	1.7	2.4	15.6	5.1	1.5	0	0	0
18	277.8	0.4	189.7	64.6	1.1	4.9	0.4	0	12.8	4.0	0	0	0	0
19	260.9	1.6	191.2	58.9	0	5.4	1.2	0	2.6	0	0	0	0	0
20	242.0	1.6	168.3	54.3	0.4	8.6	1.2	0	2.8	3.6	1.3	0	0	0
21	182.4	0.8	133.0	40.8	0	4.9	0	0	3.0	0	0	0	0	0
22	83.8	0.8	56.2	22.5	0	1.2	0.4	0	1.1	1.5	0	0	0	0
23	40.6	0	32.2	6.3	0	0.8	0	0	0.6	0.6	0	0	0	0
Total	**4,949.2**	**23.4**	**3,335.1**	**1,126.3**	**30.2**	**153.0**	**32.2**	**22.2**	**137.1**	**64.8**	**18.7**	**3.3**	**0**	**2.9**
%	**100.0**	**0.5**	**67.4**	**22.8**	**0.6**	**3.1**	**0.7**	**0.4**	**2.8**	**1.3**	**0.4**	**0.1**	**0**	**0.1**

Kentucky Transportation Cabinet

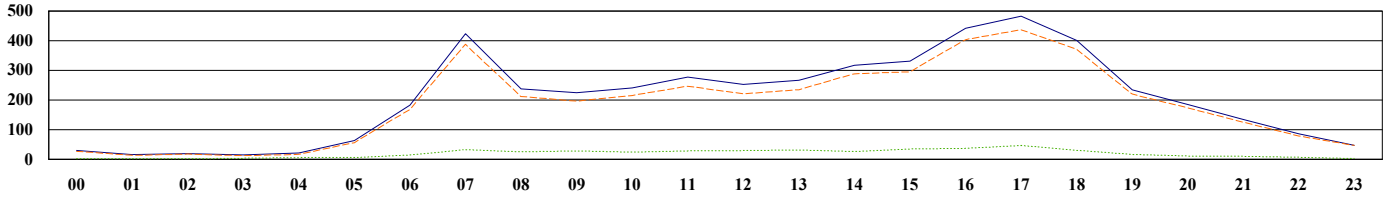
24 Hour Directional Summary, Neg Bound for May 18, 2016

003044, 003-KY-0151 -0000
FC16 **Anderson County**

003-KY-0151 -000 @ .400 From: US 127 AND US 127 BYPASS To: KY 5

	Total	Total	Peak	Peak
Private:	4,456.1	90.3	436.8	90.4
Single:	222.9	4.5	16.4	3.4
Combo:	226.3	4.6	29.5	6.1
Trucks:	449.2	9.1	45.9	9.5
Total:	4,934.4		483.1	

Peak Hour: 17
Axle Factor: 0.94



	VOL	MC	CAR	PU	BUS	2D	SU 3	SU 4+	ST 4-	ST 5	ST 6+	MT 5-	MT 6	MT 7+
0	30.1	0.4	19.8	7.1	0.3	1.2	0.4	0	0	0.9	0	0	0	0
1	15.7	0.4	9.1	3.3	0.3	0.8	0.4	0	0.4	0.9	0	0	0	0
2	19.0	0	14.5	3.3	0	0.4	0	0	0.4	0.5	0	0	0	0
3	15.3	0	10.3	1.7	0.4	0.4	1.2	0	0	1.3	0	0	0	0
4	21.7	0	8.1	7.6	0.7	1.2	0	0	0	4.2	0	0	0	0
5	63.9	0.4	39.1	17.0	1.7	1.6	3.6	0	0	0.5	0	0	0	0
6	183.1	0	111.7	56.0	1.4	6.0	0	0.8	3.2	4.0	0	0	0	0
7	423.6	1.8	276.1	109.2	4.1	12.8	1.6	0.8	12.7	4.0	0.5	0	0	0
8	237.4	1.1	139.0	71.7	0.4	13.2	3.2	0	5.3	2.7	0.9	0	0	0
9	224.6	1.5	130.7	63.5	1.4	7.6	5.2	1.6	5.4	6.3	1.4	0	0	0
10	241.2	0.4	143.1	71.2	3.1	8.8	2.8	0	6.8	5.0	0	0	0	0
11	277.3	1.8	180.5	63.9	2.8	10.4	4.8	0.4	7.7	4.4	0.5	0	0	0
12	252.5	0.8	163.8	55.7	2.8	11.9	2.1	0.8	9.8	3.2	1.1	0.6	0	0
13	266.5	2.6	157.6	74.7	0.3	11.7	3.6	0.4	6.8	5.1	1.5	1.5	0	0.6
14	316.9	3.1	203.6	81.5	2.8	11.5	1.2	0.4	6.8	5.1	0.4	0	0	0.4
15	331.5	3.4	194.8	96.7	2.1	11.9	4.8	0	12.8	2.4	1.9	0.6	0	0
16	441.8	1.5	296.3	105.8	2.1	14.8	3.2	0	13.7	1.3	1.7	1.1	0	0.4
17	483.1	1.9	332.0	102.9	0.3	12.8	3.3	0.4	24.3	4.1	0	1.1	0	0
18	401.6	1.1	279.9	89.6	0.7	10.3	2.4	0.8	12.4	3.2	0.6	0.4	0	0
19	234.9	2.7	164.3	52.1	0	7.0	0.8	0.4	5.8	1.7	0	0	0	0
20	185.1	1.1	123.4	49.1	0.7	4.5	0.4	0.4	4.3	1.3	0	0	0	0
21	134.3	0.8	85.4	38.1	0	5.3	0.4	0.4	2.2	1.7	0	0	0	0
22	85.8	0	57.5	21.3	0.7	1.6	0	0.4	3.0	1.3	0	0	0	0
23	47.7	0	33.9	12.1	0	1.6	0	0	0	0	0	0	0	0
Total	**4,934.4**	**26.6**	**3,174.4**	**1,255.2**	**29.1**	**169.3**	**45.5**	**8.2**	**143.8**	**65.1**	**10.4**	**5.3**	**0**	**1.5**
%	**100.0**	**0.5**	**64.3**	**25.4**	**0.6**	**3.4**	**0.9**	**0.2**	**2.9**	**1.3**	**0.2**	**0.1**	**0**	**0**

Kentucky Transportation Cabinet

Daily Volume from 05/18/2016 through 05/20/2016

Site Names: 003044, 003-KY-0151 -0000
County: Anderson
Funct. Class: U Minor Arterial
Location: 003-KY-0151 -000 @ .400 From: US 127 AND US 127 BYPASS To: KY 512

Seasonal Factor Type: 3
Daily Factor Type: 3
Axle Factor Type: 16
Growth Factor Type: 16

	Sun 05/15/2016			Mon 05/16/2016			Tue 05/17/2016			Wed 05/18/2016			Thu 05/19/2016			Fri 05/20/2016			Sat 05/21/2016		
	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS
00:00													53	34	19	32	23	9			
01:00													18	12	6	28	19	9			
02:00													24	15	9	30	21	9			
03:00													31	16	15	32	14	18			
04:00													50	18	32	69	25	44			
05:00													205	66	139	185	57	128			
06:00													387	182	205	337	164	173			
07:00													715	406	309	746	398	348			
08:00													473	239	234	474	216	258			
09:00													413	202	211	438	231	207			
10:00													458	234	224	458	226	232			
11:00													458	246	212	548	288	260			
12:00										461	228	233	501	225	276						
13:00										513	241	272	508	238	270						
14:00										523	270	253	545	297	248						
15:00										634	280	354	668	315	353						
16:00										711	362	349	820	424	396						
17:00										807	398	409	849	458	391						
18:00										539	319	220	661	392	269						
19:00										431	201	230	443	215	228						
20:00										347	152	195	409	175	234						
21:00										238	111	127	323	128	195						
22:00										118	60	58	183	93	90						
23:00										60	33	27	95	51	44						
Volume										5,382	2,655	2,727	9,290	4,681	4,609	3,377	1,682	1,695			
AM Peak Vol													715	406	309	746	398	348			
AM Peak Fct													1.00	1.00	1.00	1.00	1.00	1.00			
AM Peak Hr													7:00	7:00	7:00	7:00	7:00	7:00			
PM Peak Vol										807	398	409	849	458	396						
PM Peak Fct										1.00	1.00	1.00	1.00	1.00	1.00						
PM Peak Hr										17:00	17:00	17:00	17:00	17:00	16:00						
Seasonal Fct										0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962			
Daily Fct										0.961	0.961	0.961	0.941	0.941	0.941	0.872	0.872	0.872			
Axle Fct										0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500			
Pulse Fct										2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000			

Collected by: KYTC
Created 05/20/2016 3:24:20PM

ROAD AADT 8,109 **NEG AADT 4,051** **POS AADT 4,058**

Kentucky Transportation Cabinet

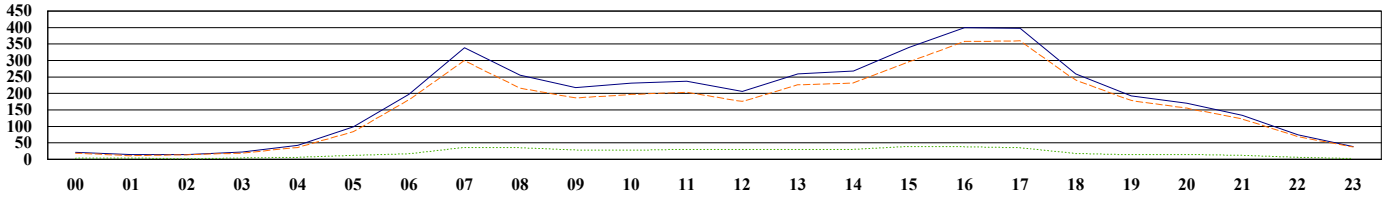
24 Hour Roadway Summary for May 18, 2016

003002, 003-KY-0151 -0001.761
FC6 **Anderson County**

003-KY-0151 -000 @ 2.700 From: KY 512 To: FRANKLIN COUNTY LI

	Total	Total	Peak	Peak
Private:	3,904.3	88.0	356.6	89.1
Single:	320.0	7.2	24.0	6.0
Combo:	145.7	3.3	14.0	3.5
Trucks:	465.7	10.5	38.0	9.5
Total:	4,434.4		400.0	

Peak Hour: 16
Axle Factor: 0.95



	VOL	MC	CAR	PU	BUS	2D	SU 3	SU 4+	ST 4-	ST 5	ST 6+	MT 5-	MT 6	MT 7+
0	21.5	0	13.9	4.3	0.4	2.2	0	0	0	0.7	0	0	0	0
1	14.9	1.3	7.4	2.2	0.4	2.2	0.4	0	0	1.0	0	0	0	0
2	14.5	0	10.8	2.7	0	0.7	0	0	0.4	0	0	0	0	0
3	22.6	1.3	14.2	3.1	0.4	1.4	1.1	0	0	1.1	0	0	0	0
4	42.2	0	21.8	13.5	0.9	2.5	0	0	0.3	3.1	0	0	0	0
5	98.9	0	60.5	23.1	3.4	8.3	2.5	0	0.7	0.4	0	0	0	0
6	197.7	1.3	130.7	48.0	1.3	12.6	0.4	0	1.7	1.1	0.7	0	0	0
7	339.0	10.9	217.0	70.9	4.7	17.3	4.3	0.7	9.4	3.5	0.3	0	0	0
8	255.5	6.8	150.8	58.1	4.7	17.0	5.4	3.6	3.8	5.3	0	0	0	0
9	218.1	4.1	122.1	59.5	4.7	13.3	3.5	1.8	3.5	4.5	0.7	0	0	0.3
10	231.4	2.8	142.1	51.8	7.3	11.2	3.6	3.3	2.4	5.9	1.0	0	0	0
11	236.9	6.9	137.4	58.7	4.3	14.4	7.2	0.7	3.4	2.8	1.1	0	0	0
12	206.2	5.3	127.7	42.3	2.0	14.8	2.6	2.6	5.4	3.2	0.4	0	0	0
13	259.2	2.8	161.2	61.6	3.6	17.0	4.4	0.4	4.7	2.5	1.1	0	0	0
14	268.3	4.1	166.6	61.1	6.2	15.5	3.0	1.5	5.4	3.2	1.4	0	0	0.4
15	339.7	8.2	196.7	90.8	4.9	19.6	5.5	1.8	7.2	3.6	1.4	0	0	0
16	400.0	1.4	265.3	89.9	5.4	19.6	3.7	0.7	11.2	2.5	0.4	0	0	0
17	397.5	8.2	275.4	75.3	4.0	16.6	3.3	1.5	10.4	1.8	1.1	0	0	0
18	259.2	2.7	176.9	60.7	1.7	10.0	1.5	0.4	3.2	2.2	0	0	0	0
19	192.9	2.7	132.7	43.1	1.2	8.9	0.4	0.4	2.5	1.1	0	0	0	0
20	170.6	6.6	113.0	35.1	1.6	8.1	1.5	0.4	3.2	1.1	0	0	0	0
21	134.0	1.4	89.5	31.3	0.4	8.1	0	0	1.4	1.8	0	0	0	0
22	74.8	0	50.2	18.4	0.8	3.3	0	0.4	0.7	1.1	0	0	0	0
23	38.6	0	27.6	8.8	0	1.5	0	0	0	0.4	0.4	0	0	0
Total	**4,434.4**	**78.6**	**2,811.2**	**1,014.4**	**64.4**	**245.9**	**54.2**	**20.0**	**81.2**	**53.9**	**9.9**	**0**	**0**	**0.7**
%	**100.0**	**1.8**	**63.4**	**22.9**	**1.5**	**5.5**	**1.2**	**0.5**	**1.8**	**1.2**	**0.2**	**0**	**0**	**0**

Kentucky Transportation Cabinet

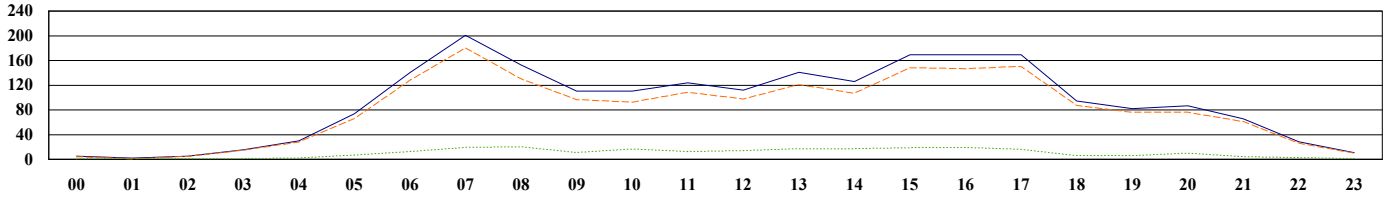
24 Hour Directional Summary, Pos Bound for May 18, 2016

003002, 003-KY-0151 -0001.761
FC6 **Anderson County**

003-KY-0151 -000 @ 2.700 From: KY 512 To: FRANKLIN COUNTY LI

	Total	Total	Peak	Peak
Private:	1,958.7	88.0	180.0	89.5
Single:	165.1	7.4	14.8	7.3
Combo:	69.1	3.1	4.6	2.3
Trucks:	234.2	10.5	19.3	9.6
Total:	2,225.8		201.0	

Peak Hour: 7
Axle Factor: 0.95



	VOL	MC	CAR	PU	BUS	2D	SU 3	SU 4+	ST 4-	ST 5	ST 6+	MT 5-	MT 6	MT 7+
0	5.1	0	3.2	1.1	0	0.7	0	0	0	0	0	0	0	0
1	2.2	0	0.4	0.4	0	1.1	0	0	0	0.4	0	0	0	0
2	5.4	0	3.9	0.8	0	0.7	0	0	0	0	0	0	0	0
3	15.7	1.3	10.6	2.7	0	1.1	0	0	0	0	0	0	0	0
4	30.1	0	17.5	10.5	0	1.1	0	0	0	1.1	0	0	0	0
5	73.8	0	46.9	18.8	1.3	5.8	0	0	0.7	0.4	0	0	0	0
6	140.4	1.3	91.3	34.7	0.9	10.8	0.4	0	1.0	0	0	0	0	0
7	201.0	4.3	138.5	37.3	1.7	11.5	2.5	0.7	3.1	1.4	0	0	0	0
8	152.8	2.7	94.0	33.5	2.6	8.7	2.5	3.2	2.8	2.8	0	0	0	0
9	110.3	4.1	63.9	28.7	3.0	6.4	1.1	0.7	1.1	1.1	0.3	0	0	0
10	110.7	2.8	67.7	22.1	1.7	5.8	2.5	3.3	1.0	3.2	0.7	0	0	0
11	123.9	2.7	69.1	36.7	3.0	6.5	1.8	0.4	2.4	0.7	0.7	0	0	0
12	112.1	5.3	66.1	25.9	0.8	6.3	1.8	1.8	2.5	1.4	0	0	0	0
13	140.7	0	88.3	32.7	2.8	11.1	1.1	0.4	2.5	0.7	1.1	0	0	0
14	125.9	4.1	74.5	28.0	2.4	8.9	2.2	1.1	2.2	1.8	0.7	0	0	0
15	169.2	2.8	100.9	44.3	2.4	8.9	3.0	1.5	3.2	1.4	0.7	0	0	0
16	169.5	0	109.6	36.8	4.2	9.2	1.1	0.7	5.0	2.5	0.4	0	0	0
17	169.2	6.7	109.7	33.9	2.8	5.9	1.1	1.5	5.8	0.7	1.1	0	0	0
18	94.6	0	61.1	26.4	1.3	3.0	0	0	1.8	1.1	0	0	0	0
19	82.1	0	55.3	20.5	0.8	3.7	0	0.4	1.1	0.4	0	0	0	0
20	86.5	5.1	52.3	18.4	0.8	5.2	1.5	0	2.2	1.1	0	0	0	0
21	65.5	0	46.8	14.2	0.4	2.6	0	0	1.1	0.4	0	0	0	0
22	28.5	0	18.4	7.5	0	1.8	0	0	0.4	0.4	0	0	0	0
23	10.7	0	8.0	1.7	0	0.4	0	0	0	0.4	0.4	0	0	0
Total	**2,225.8**	**43.2**	**1,398.1**	**517.4**	**32.9**	**126.9**	**22.6**	**15.6**	**39.9**	**23.1**	**6.1**	**0**	**0**	**0**
%	**100.0**	**1.9**	**62.8**	**23.2**	**1.5**	**5.7**	**1.0**	**0.7**	**1.8**	**1.0**	**0.3**	**0**	**0**	**0**

Kentucky Transportation Cabinet

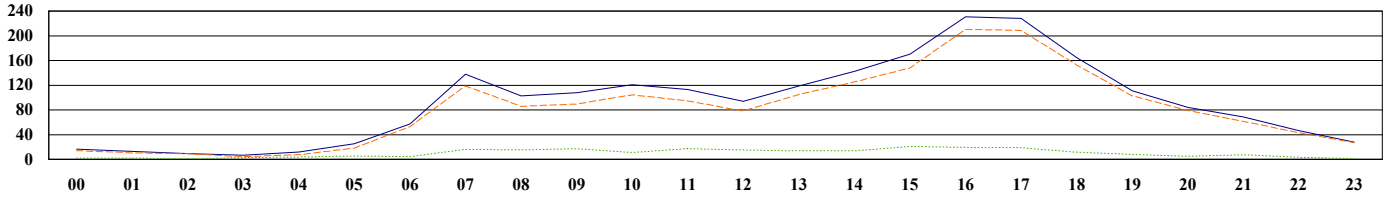
24 Hour Directional Summary, Neg Bound for May 18, 2016

003002, 003-KY-0151 -0001.761
FC6 **Anderson County**

003-KY-0151 -000 @ 2.700 From: KY 512 To: FRANKLIN COUNTY LI

	Total	Total	Peak	Peak
Private:	1,945.6	88.1	210.2	91.2
Single:	155.0	7.0	12.9	5.6
Combo:	76.6	3.5	6.1	2.7
Trucks:	231.6	10.5	19.0	8.3
Total:	2,208.6		230.5	

Peak Hour: 16
Axle Factor: 0.95



	VOL	MC	CAR	PU	BUS	2D	SU 3	SU 4+	ST 4-	ST 5	ST 6+	MT 5-	MT 6	MT 7+
0	16.4	0	10.7	3.1	0.4	1.5	0	0	0	0.7	0	0	0	0
1	12.7	1.3	7.0	1.9	0.4	1.1	0.4	0	0	0.7	0	0	0	0
2	9.2	0	6.9	1.9	0	0	0	0	0.4	0	0	0	0	0
3	6.9	0	3.6	0.4	0.4	0.4	1.1	0	0	1.1	0	0	0	0
4	12.1	0	4.3	3.1	0.9	1.5	0	0	0.3	2.1	0	0	0	0
5	25.1	0	13.6	4.3	2.1	2.5	2.5	0	0	0	0	0	0	0
6	57.3	0	39.3	13.3	0.4	1.8	0	0	0.7	1.1	0.7	0	0	0
7	138.0	6.6	78.6	33.6	3.0	5.8	1.8	0	6.2	2.1	0.3	0	0	0
8	102.7	4.1	56.8	24.6	2.1	8.3	2.9	0.4	1.1	2.5	0	0	0	0
9	107.8	0	58.2	30.9	1.7	6.9	2.5	1.1	2.5	3.5	0.3	0	0	0.3
10	120.7	0	74.4	29.8	5.6	5.4	1.1	0	1.4	2.8	0.3	0	0	0
11	113.1	4.3	68.3	22.0	1.3	7.9	5.4	0.4	1.0	2.1	0.3	0	0	0
12	94.0	0	61.5	16.3	1.2	8.5	0.7	0.7	2.9	1.8	0.4	0	0	0
13	118.6	2.8	72.8	28.9	0.8	5.9	3.3	0	2.2	1.8	0	0	0	0
14	142.4	0	92.1	33.0	3.8	6.6	0.7	0.4	3.2	1.4	0.7	0	0	0.4
15	170.5	5.3	95.8	46.4	2.5	10.7	2.6	0.4	4.0	2.2	0.7	0	0	0
16	230.5	1.4	155.7	53.1	1.2	10.3	2.6	0	6.1	0	0	0	0	0
17	228.3	1.4	165.7	41.4	1.2	10.7	2.2	0	4.7	1.1	0	0	0	0
18	164.6	2.7	115.8	34.3	0.4	7.0	1.5	0.4	1.4	1.1	0	0	0	0
19	110.8	2.7	77.4	22.6	0.4	5.2	0.4	0	1.4	0.7	0	0	0	0
20	84.0	1.4	60.7	16.7	0.8	2.9	0	0.4	1.1	0	0	0	0	0
21	68.6	1.4	42.7	17.1	0	5.5	0	0	0.4	1.4	0	0	0	0
22	46.3	0	31.8	10.9	0.8	1.5	0	0.4	0.4	0.7	0	0	0	0
23	27.9	0	19.7	7.1	0	1.1	0	0	0	0	0	0	0	0
Total	**2,208.6**	**35.4**	**1,413.2**	**497.0**	**31.5**	**119.0**	**31.6**	**4.4**	**41.3**	**30.7**	**3.9**	**0**	**0**	**0.7**
%	**100.0**	**1.6**	**64.0**	**22.5**	**1.4**	**5.4**	**1.4**	**0.2**	**1.9**	**1.4**	**0.2**	**0**	**0**	**0**

Kentucky Transportation Cabinet

Daily Volume from 05/18/2016 through 05/20/2016

Site Names: 003044, 003-KY-0151 -0000
County: Anderson
Funct. Class: U Minor Arterial
Location: 003-KY-0151 -000 @ .400 From: US 127 AND US 127 BYPASS To: KY 512

Seasonal Factor Type: 3
Daily Factor Type: 3
Axle Factor Type: 16
Growth Factor Type: 16

	Sun 05/15/2016			Mon 05/16/2016			Tue 05/17/2016			Wed 05/18/2016			Thu 05/19/2016			Fri 05/20/2016			Sat 05/21/2016		
	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS	ROAD	NEG	POS
00:00													53	34	19	32	23	9			
01:00													18	12	6	28	19	9			
02:00													24	15	9	30	21	9			
03:00													31	16	15	32	14	18			
04:00													50	18	32	69	25	44			
05:00													205	66	139	185	57	128			
06:00													387	182	205	337	164	173			
07:00													715	406	309	746	398	348			
08:00													473	239	234	474	216	258			
09:00													413	202	211	438	231	207			
10:00													458	234	224	458	226	232			
11:00													458	246	212	548	288	260			
12:00										461	228	233	501	225	276						
13:00										513	241	272	508	238	270						
14:00										523	270	253	545	297	248						
15:00										634	280	354	668	315	353						
16:00										711	362	349	820	424	396						
17:00										807	398	409	849	458	391						
18:00										539	319	220	661	392	269						
19:00										431	201	230	443	215	228						
20:00										347	152	195	409	175	234						
21:00										238	111	127	323	128	195						
22:00										118	60	58	183	93	90						
23:00										60	33	27	95	51	44						
Volume										5,382	2,655	2,727	9,290	4,681	4,609	3,377	1,682	1,695			
AM Peak Vol													715	406	309	746	398	348			
AM Peak Fct													1.00	1.00	1.00	1.00	1.00	1.00			
AM Peak Hr													7:00	7:00	7:00	7:00	7:00	7:00			
PM Peak Vol										807	398	409	849	458	396						
PM Peak Fct										1.00	1.00	1.00	1.00	1.00	1.00						
PM Peak Hr										17:00	17:00	17:00	17:00	17:00	16:00						
Seasonal Fct										0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962	0.962			
Daily Fct										0.961	0.961	0.961	0.941	0.941	0.941	0.872	0.872	0.872			
Axle Fct										0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500			
Pulse Fct										2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000			

Collected by: KYTC
Created 05/20/2016 3:24:20PM

ROAD AADT 8,109 **NEG AADT 4,051** **POS AADT 4,058**

Capacity Analysis Details

Methodology used: Transportation Research Board's Highway Capacity Manual 2010 and AASHTO's Greenbook

Capacity assumptions and calculations

- highest recorded AADT of 8,917 vpd
- directional bias of 65%
- peak hour factor of 13%
- peak directional volume = (8,917 vehicles/day)(0.65) (0.13) = 753 vehicles/hour/lane
- trucks accounted for 6.3% of the traffic volumes
- each truck is the equivalent of three passenger cars: # of trucks=(753v/hr)(0.063)=47.44
- truck passenger car equivalent (PCE) = (47.44 trucks)(3 PCE/truck) = 142 PCE
- 753 vehicles – 47 trucks = 706 passenger cars
- 706 passenger cars + 142 PCE = 848 passenger cars or equivalents

Current capacity (v/c) = (848 PCE/hr)/(1700 pc/hr) = 0.50

Future capacity: KYTC's statewide travel demand model: traffic on KY 151 is projected to grow 1.1% annually, or about 24% over the next 20 years. Assuming that the passenger cars and trucks will grow at the same 1.1% annual growth rate, the estimated peak hour direction of passenger car equivalents: PCE = 848 PCE x 1.011^{20} (factor representing 20 years of growth at 1.1% annually) = 1,055 PCE.

Future capacity (v/c) = (1,055 PCE/hr)/(1700 pc/hr) = 0.62

Appendix C

Roadway Geometric Analysis Details

Horizontal Curves from US 127 to I-64

Offtracking Analysis Calculation Sheets

Offtrackng Analysis Summary

Vertical Curves from US 127 to I-64

Ball-Bank Indicator Analysis

Curve Warning Sign Inventory and Rumble Strip Inventory

Roadway Geometry Analysis Details

Horizontal Curve assumptions

To be able to confirm that there are no horizontal curve deficiencies, would require the existing cross-slope to be compared with the existing radius. The existing cross-slope is unknown and therefore only general conclusions can be drawn. While all curves (with the exception of the curve at MP 0.1, Anderson County) meet the minimum radius for their respective design speeds, the minimum radius requires that the maximum superelevation rate (Kentucky commonly uses 8%) be applied to the curve. It is possible that the superelevation rates do not meet the current standards even though the curve radii are greater than the minimum radius. The most specific conclusion that can be drawn from this analysis is that if a highway project is intended to correct any horizontal curve deficiencies, then it could be done within the current pavement limits with superelevation modifications that will not require a horizontal alignment change.

Vehicle offtracking

Analysis Method

Guidance from the "Green Book" was followed in the analysis. The "Green Book" contains the current design research and practices for highway and street geometric design. The "Green Book" has a series of formulae that calculate required curve widening based on design vehicle attributes, design speed, available pavement width, and curve radius.

Design Vehicle Attributes

The design vehicle attributes were taken from the "Green Book" Chapter 2 – Design Controls and Criteria. The WB-50 is not included in the 2011 "Green Book" so the values for the WB-40 were used and adjusted to make the wheelbase 50' by making the trailer 10' longer. Additionally, the 96" Wide WB-62 and WB-67 were not included in the "Green Book" but a simple adjustment of the vehicle width in the calculation allowed these vehicles to be analyzed.

Design Speed

KY 151 has a posted speed limit of 55 mph for the majority of the route. The curves at Anderson County MP 0.1, 1.2, and 1.5 are posted at 45 mph, and the curve at Anderson County MP 1.7 is posted at 35 mph. It is reasonable to assume for calculation purposes that vehicles are operating at the speed limit, and therefore the posted speed was chosen as the design speed.

Available Pavement Width

The available pavement width was determined by field measured pavement widths for all 14 analyzed curves.

Curve Radius

The approximate curve radius of each curve on this corridor was taken from archived plans. For MP 1.2 and MP 1.5 archived plans could not be located so the curve radius was estimated from aerial photography. MP 3.7 was identified in the existing plans as a horizontal deflection angle of 0°58'. Assuming a distance of 50' to achieve this transition in the field yields a degree of curve of roughly 2°, corresponding with a radius of 2864.9'. This radius was used for offtracking calculations.

Vertical Curve assumptions

An existing profile was created by drawing a horizontal alignment over an aerial image and then extracting LiDAR (a surveying technique that uses radar) elevation data along this alignment. The LiDAR data allowed a theoretical vertical alignment to be best fit to the actual ground data. This vertical alignment was then compared to current design standards in the AASHTO Green Book.

It should be noted that the approximate horizontal alignment differed by several hundred feet in length from the HIS. This means that the vertical curve locations should be seen as approximate curve locations. It also means that the speed limit changes may occur in slightly different locations thus affecting the "Current Design Standards Sight Distance" value for curves in the vicinity of a speed change. The stationing was adjusted so that the county line represents MP 0.0, so any error developed by length discrepancies in the Anderson County section is "reset" at the county line.

It should also be noted that the theoretical vertical alignment that was best fit to the LiDAR data is not an exact representation of the ground elevations along the centerline. Variations between the elevation data and the theoretical vertical alignment mandate that the existing sight distances calculated should be seen as "Approximate Sight Distances". A substandard "Approximate Sight Distance" indicates that it is likely that the current design standards are not met, but further investigation would be required to know conclusively. Similarly, a vertical curve with an "Approximate Sight Distance" that exceeds the "Current Design Standard Sight Distance" value should be viewed as likely to meet the current design standards, but the analysis not conclusive. Sight distance is the length of roadway ahead visible to the driver, or how far a driver can see before the line of sight is blocked by a hill crest or object.

Horizontal Curves from US 127 to I-64

	County	Beginning MP	Ending MP	Degree of Curvature	Curve Direction
1	Anderson	0	0.084	0.2	R
2		0.084	0.161	13.4	R
3		0.161	0.842	0	L
4		0.842	1.181	0.1	L
5		1.181	1.256	1.6	L
6		1.256	1.387	0	
7		1.387	1.498	3.1	L
8		1.498	1.614	0	L
9		1.614	1.728	2.9	L
10		1.728	2.045	0	
11		2.045	2.211	0.6	L
12		2.211	2.519	0	
13		2.519	2.691	2	R
14		2.691	2.855	0	R
15		2.855	3.009	3	R
16		3.009	3.729	0.1	R
17		3.729	3.985	0.5	R
18		3.985	4.278	0.1	R
19		4.278	4.463	3.5	L
20		4.463	4.587	0	
21	Franklin	0	0.323	0	
22		0.323	0.436	2.3	R
23		0.436	1.52	0	R
24		1.52	1.618	0.5	L
25		1.618	1.745	0	
26		1.745	1.896	3.8	R
27		1.896	2.15	0.1	L
28		2.15	2.225	0.1	R
29		2.225	2.284	0	
30		2.284	2.29	0	
31		2.29	2.402	4.8	L

Denotes curves that were analyzed

Degree of Curvature: the central angle formed by a chord of 100 feet

Curve Direction: the direction the roadway curves as observed when traveling in the cardinal direction (North, in the case of KY 151)

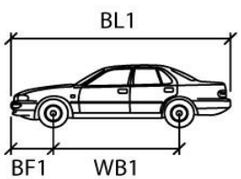
KY 151 Offtracking Analysis - Milepoint 0.1, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	424.41	424.41	424.41	424.41	424.41	424.41	424.41	424.41	424.41	424.41
Design speed, (V) mph	45	45	45	45	45	45	45	45	45	45
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18
Track width on curve, (U) ft	7.14	8.53	8.47	8.74	8.95	9.67	10.44	10.90	10.94	11.40
Width of front overhang, (F_A) ft	0.09	0.13	0.21	0.25	0.10	0.00	0.20	0.20	0.20	0.20
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	21.56	24.39	24.33	24.91	25.19	26.53	28.26	29.18	29.26	30.18
Existing traveled way width, ft	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Curve widening, ft	-20.44	-17.61	-17.67	-17.09	-16.81	-15.47	-13.74	-12.82	-12.74	-11.82

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

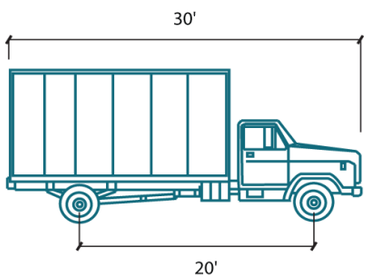
Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

P=Passenger car S=School Bus SU=Single Unit Truck, defined by total length WB=Wheel base truck, defined by the length of wheel base

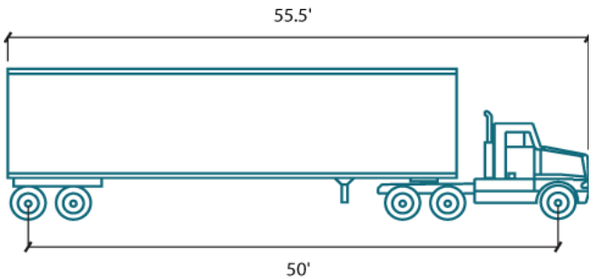


P

S-BUS-36



SU-30



WB-50

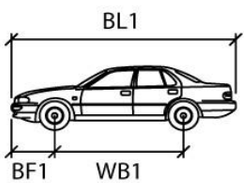
KY 151 Offtracking Analysis - Milepoint 1.2, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft (estimated from aerial)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Design speed, (V) mph	45	45	45	45	45	45	45	45	45	45
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
Track width on curve, (U) ft	7.03	8.11	8.10	8.16	8.20	8.35	8.52	8.61	9.02	9.11
Width of front overhang, (F_A) ft	0.02	0.03	0.04	0.05	0.02	0.00	0.04	0.04	0.04	0.04
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.09	22.26	22.25	22.37	22.43	22.71	23.08	23.27	24.08	24.27
Existing traveled way width, ft	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Curve widening, ft	-4.91	-2.74	-2.75	-2.63	-2.57	-2.29	-1.92	-1.73	-0.92	-0.73

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

P=Passenger car S=School Bus SU=Single Unit Truck, defined by total length WB=Wheel base truck, defined by the length of wheel base



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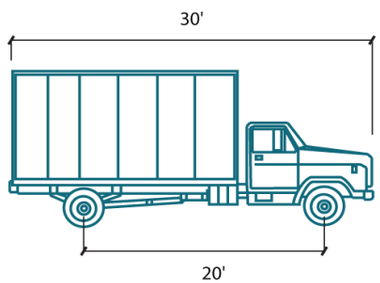
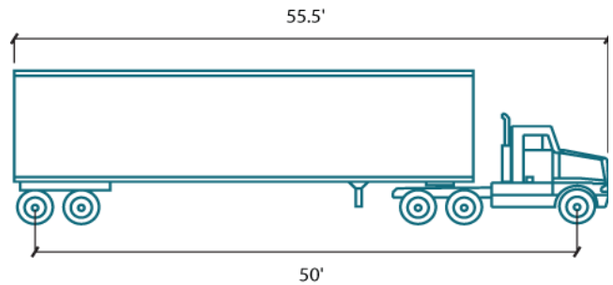


SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 1.5, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Design speed, (V) mph	45	45	45	45	45	45	45	45	45	45
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Track width on curve, (U) ft	7.04	8.15	8.13	8.21	8.27	8.47	8.69	8.82	9.19	9.32
Width of front overhang, (F_A) ft	0.02	0.04	0.06	0.07	0.03	0.00	0.06	0.06	0.06	0.06
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.27	22.50	22.49	22.65	22.73	23.11	23.59	23.85	24.59	24.85
Existing traveled way width, ft	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4
Curve widening, ft	-5.13	-2.90	-2.91	-2.75	-2.67	-2.29	-1.81	-1.55	-0.81	-0.55

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

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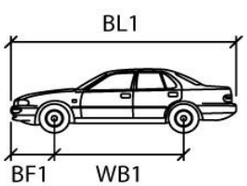

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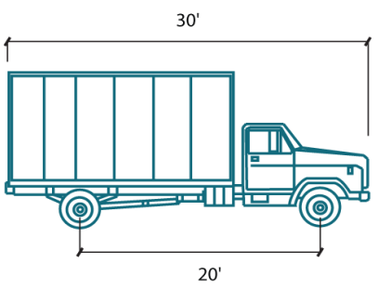
S-BUS-36



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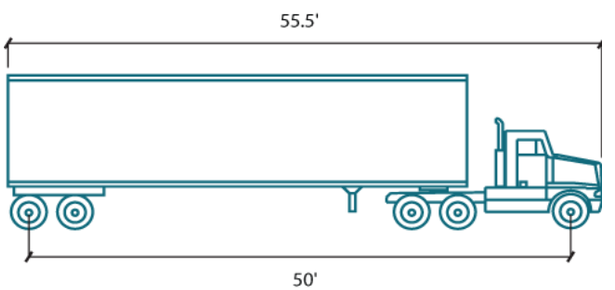

WB-50

KY 151 Offtracking Analysis - Milepoint 1.7, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1432.7	1432.7	1432.7	1432.7	1432.7	1432.7	1432.7	1432.7	1432.7	1432.7
Design speed, (V) mph	35	35	35	35	35	35	35	35	35	35
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Track width on curve, (U) ft	7.04	8.16	8.14	8.22	8.28	8.49	8.72	8.86	9.22	9.36
Width of front overhang, (F_A) ft	0.03	0.04	0.06	0.08	0.03	0.00	0.06	0.06	0.06	0.06
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.04	22.28	22.27	22.44	22.52	22.91	23.42	23.70	24.42	24.70
Existing traveled way width, ft	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5
Curve widening, ft	-5.46	-3.22	-3.23	-3.06	-2.98	-2.59	-2.08	-1.80	-1.08	-0.80

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

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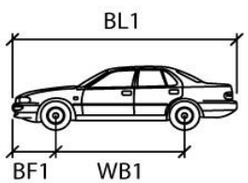
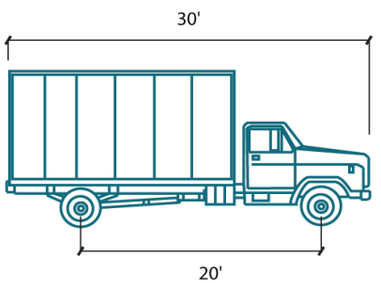
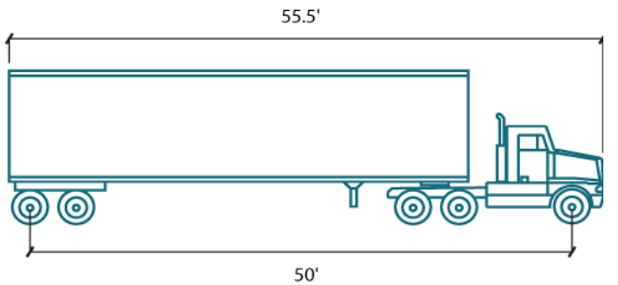


P

S-BUS-36



SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 2.1, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Track width on curve, (U) ft	7.02	8.08	8.07	8.11	8.14	8.25	8.36	8.43	8.86	8.93
Width of front overhang, (F_A) ft	0.01	0.02	0.03	0.04	0.01	0.00	0.03	0.03	0.03	0.03
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.08	22.21	22.20	22.28	22.32	22.52	22.78	22.91	23.78	23.91
Existing traveled way width, ft	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
Curve widening, ft	-4.02	-1.89	-1.90	-1.82	-1.78	-1.58	-1.32	-1.19	-0.32	-0.19

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

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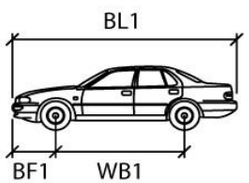
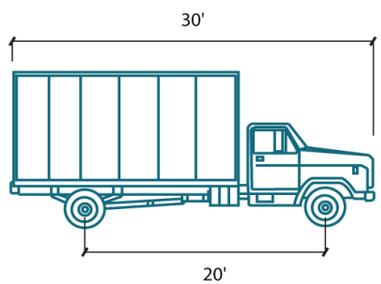
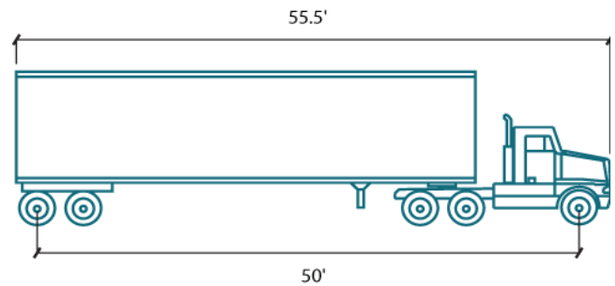


P

S-BUS-36



SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 2.6, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
Track width on curve, (U) ft	7.05	8.20	8.17	8.27	8.35	8.62	8.90	9.07	9.40	9.57
Width of front overhang, (F_A) ft	0.03	0.05	0.08	0.09	0.04	0.00	0.08	0.08	0.08	0.08
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.76	23.07	23.05	23.26	23.36	23.86	24.50	24.84	25.50	25.84
Existing traveled way width, ft	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8
Curve widening, ft	-4.04	-1.73	-1.75	-1.54	-1.44	-0.94	-0.30	0.04	0.70	1.04

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

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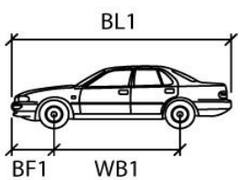
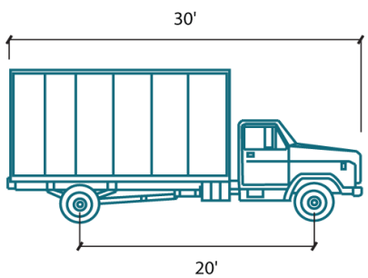


P

S-BUS-36



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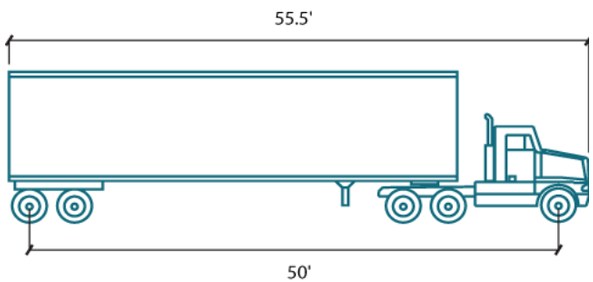

WB-50

KY 151 Offtracking Analysis - Milepoint 3.0, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3	1146.3
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
Track width on curve, (U) ft	7.05	8.20	8.17	8.27	8.35	8.62	8.90	9.07	9.40	9.57
Width of front overhang, (F_A) ft	0.03	0.05	0.08	0.09	0.04	0.00	0.08	0.08	0.08	0.08
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.76	23.07	23.05	23.26	23.36	23.86	24.50	24.84	25.50	25.84
Existing traveled way width, ft	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1
Curve widening, ft	-3.34	-1.03	-1.05	-0.84	-0.74	-0.24	0.40	0.74	1.40	1.74

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

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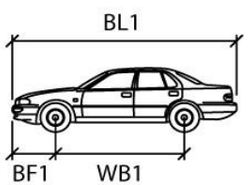

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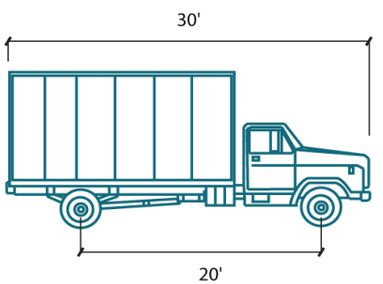
S-BUS-36



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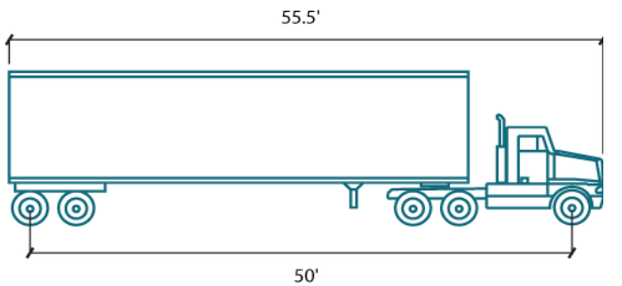

WB-50

KY 151 Offtracking Analysis - Milepoint 3.5, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	5729.6	5729.6	5729.6	5729.6	5729.6	5729.6	5729.6	5729.6	5729.6	5729.6
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Track width on curve, (U) ft	7.01	8.04	8.03	8.05	8.07	8.12	8.18	8.21	8.68	8.71
Width of front overhang, (F_A) ft	0.01	0.01	0.02	0.02	0.01	0.00	0.02	0.02	0.02	0.02
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	19.75	21.82	21.81	21.85	21.87	21.97	22.10	22.17	23.10	23.17
Existing traveled way width, ft	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2
Curve widening, ft	-5.45	-3.38	-3.39	-3.35	-3.33	-3.23	-3.10	-3.03	-2.10	-2.03

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

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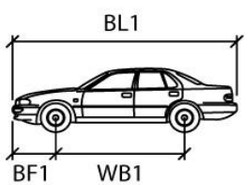

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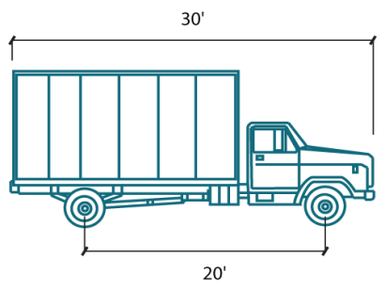
S-BUS-36



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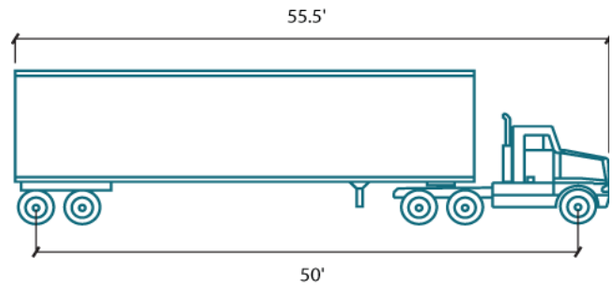

WB-50

KY 151 Offtracking Analysis - Milepoint 3.7, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Track width on curve, (U) ft	7.02	8.08	8.07	8.11	8.14	8.25	8.36	8.43	8.86	8.93
Width of front overhang, (F_A) ft	0.01	0.02	0.03	0.04	0.01	0.00	0.03	0.03	0.03	0.03
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.08	22.21	22.20	22.28	22.32	22.52	22.78	22.91	23.78	23.91
Existing traveled way width, ft	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Curve widening, ft	-4.92	-2.79	-2.80	-2.72	-2.68	-2.48	-2.22	-2.09	-1.22	-1.09

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

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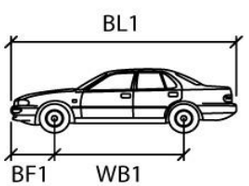
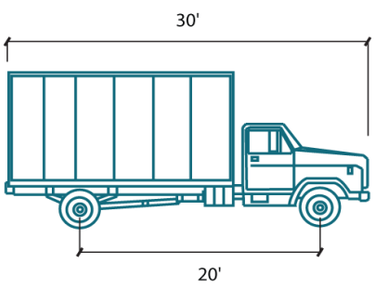
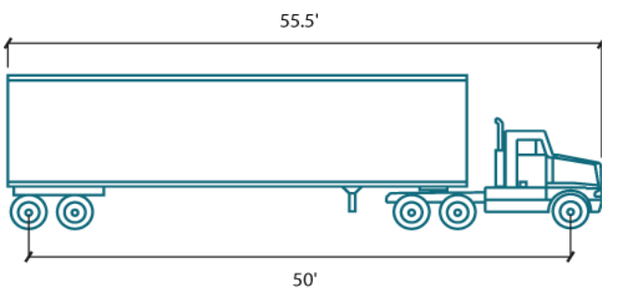


P

S-BUS-36



SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 4.0, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9	2864.9
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Track width on curve, (U) ft	7.02	8.08	8.07	8.11	8.14	8.25	8.36	8.43	8.86	8.93
Width of front overhang, (F_A) ft	0.01	0.02	0.03	0.04	0.01	0.00	0.03	0.03	0.03	0.03
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.08	22.21	22.20	22.28	22.32	22.52	22.78	22.91	23.78	23.91
Existing traveled way width, ft	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Curve widening, ft	-4.92	-2.79	-2.80	-2.72	-2.68	-2.48	-2.22	-2.09	-1.22	-1.09

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

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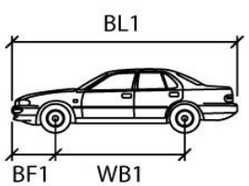
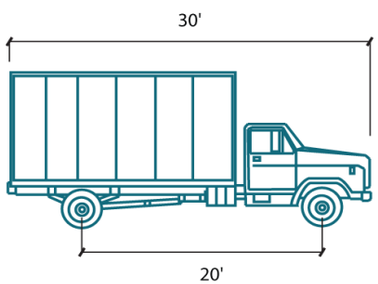
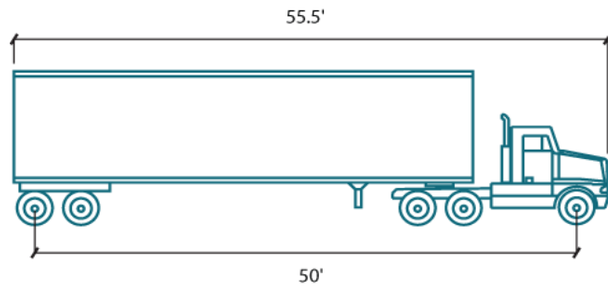


P

S-BUS-36



SU-30



WB-50

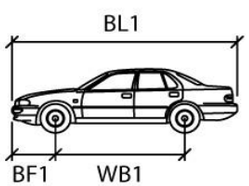
KY 151 Offtracking Analysis - Milepoint 4.4, Anderson County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Track width on curve, (U) ft	7.04	8.16	8.14	8.22	8.28	8.49	8.72	8.86	9.22	9.36
Width of front overhang, (F_A) ft	0.03	0.04	0.06	0.08	0.03	0.00	0.06	0.06	0.06	0.06
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.56	22.81	22.79	22.96	23.05	23.44	23.95	24.22	24.95	25.22
Existing traveled way width, ft	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Curve widening, ft	-21.44	-19.19	-19.21	-19.04	-18.95	-18.56	-18.05	-17.78	-17.05	-16.78

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

P=Passenger car S=School Bus SU=Single Unit Truck, defined by total length WB=Wheel base truck, defined by the length of wheel base



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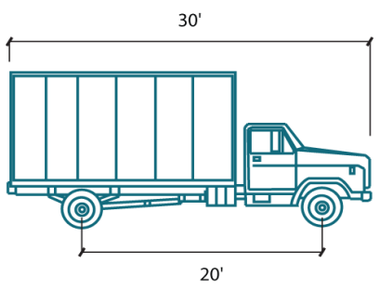
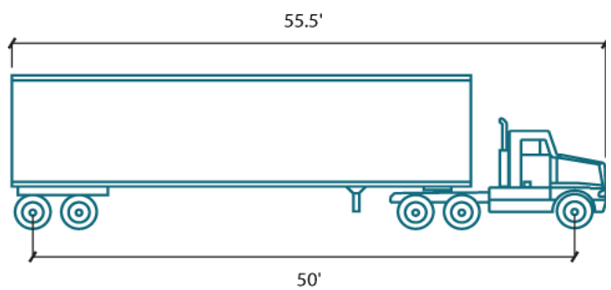
S-BUS-36



SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 0.4, Franklin County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Track width on curve, (U) ft	7.04	8.16	8.14	8.22	8.28	8.49	8.72	8.86	9.22	9.36
Width of front overhang, (F_A) ft	0.03	0.04	0.06	0.08	0.03	0.00	0.06	0.06	0.06	0.06
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.56	22.81	22.79	22.96	23.05	23.44	23.95	24.22	24.95	25.22
Existing traveled way width, ft	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
Curve widening, ft	-8.44	-6.19	-6.21	-6.04	-5.95	-5.56	-5.05	-4.78	-4.05	-3.78

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

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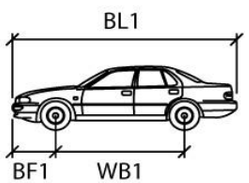

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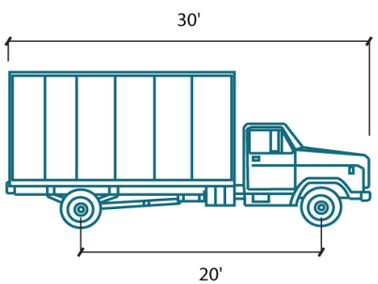
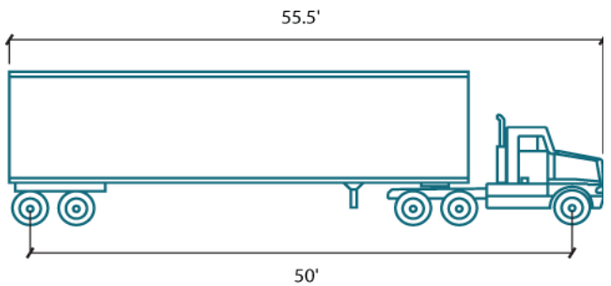
S-BUS-36



SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 1.5, Franklin County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	11459.16	11459.16	11459.16	11459.16	11459.16	11459.16	11459.16	11459.16	11459.16	11459.16
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Track width on curve, (U) ft	7.01	8.02	8.02	8.03	8.04	8.06	8.09	8.11	8.59	8.61
Width of front overhang, (F_A) ft	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	19.53	21.56	21.56	21.58	21.59	21.64	21.70	21.74	22.70	22.74
Existing traveled way width, ft	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Curve widening, ft	-14.47	-12.44	-12.44	-12.42	-12.41	-12.36	-12.30	-12.26	-11.30	-11.26

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

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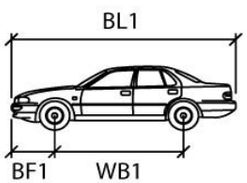

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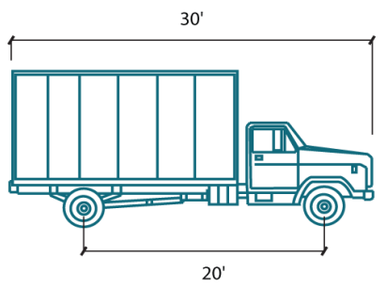
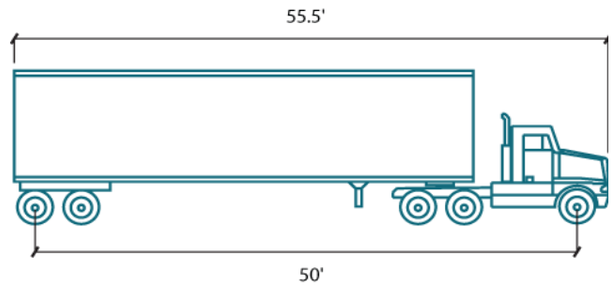
S-BUS-36



SU-30



WB-50

KY 151 Offtracking Analysis - Milepoint 1.8, Franklin County

	Allowed Vehicles						STAA Vehicles			
Design vehicle width, inches	84" Wide	96" Wide					96" Wide		102" Wide	
Design vehicle	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Width of vehicle, ft	7	8	8	8	8	8	8	8	8.5	8.5
Radius of curve, (R) ft	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4	1432.4
Design speed, (V) mph	55	55	55	55	55	55	55	55	55	55
Lateral clearance (C), ft	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Front wheelbase length of design vehicle, (L_i) ft	11	21.3	20	25	12.5	12.5	19.5	19.5	19.5	19.5
Rear wheelbase length of design vehicle, (L_i) ft					25.5	35.5	41	45.5	41	45.5
Front overhang length, (F_A) ft	3	2.5	4	4	3		4	4	4	4
Extra width allowance, (Z) ft	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Track width on curve, (U) ft	7.04	8.16	8.14	8.22	8.28	8.49	8.72	8.86	9.22	9.36
Width of front overhang, (F_A) ft	0.03	0.04	0.06	0.08	0.03	0.00	0.06	0.06	0.06	0.06
Number of lanes, (N)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Width of traveled way on curve, (W_C) ft	20.56	22.81	22.79	22.96	23.05	23.44	23.95	24.22	24.95	25.22
Existing traveled way width, ft	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Curve widening, ft	-13.44	-11.19	-11.21	-11.04	-10.95	-10.56	-10.05	-9.78	-9.05	-8.78

Analysis based on AASHTO's *A Policy on Geomteric Design of Highways and Streets, 2011, Chaper 3.3.9, Offtracking*

Available paved width on KY 151 is 22' or 11' per direction (including shoulder). The STAA ban has added almost a foot of effective width for the critical vehicle.

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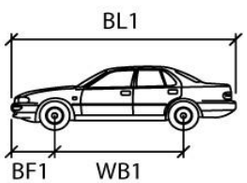
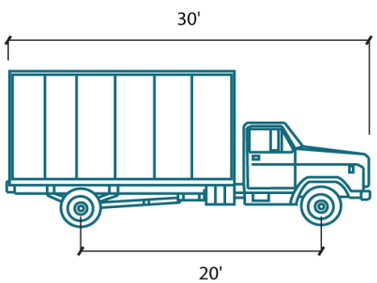


P

S-BUS-36



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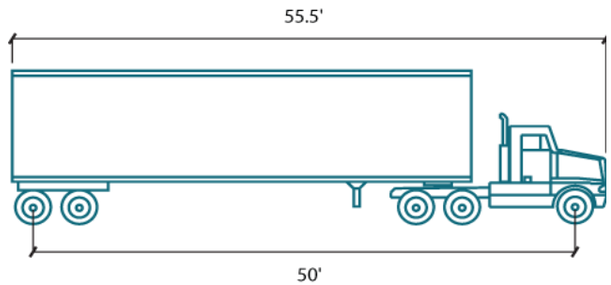

WB-50

KY 151 Offtracking Analysis Summary

		Required Pavement widening (feet)									
		Allowed Vehicles						STAA Vehicles			
		84" Wide	96" Wide					96" Wide		102" Wide	
County	Milepoint	P	S-BUS-36	SU-30	SU-40	WB-40	WB-50	WB-62	WB-67	WB-62	WB-67
Anderson	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.70	1.04
	3.0	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.74	1.40	1.74
	3.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Franklin	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Red highlighted numbers indicate curves that may require additional widening to be able to accommodate the currently prohibited STAA vehicles

Vertical Curves from US 127 to I-64

	County	Beginning MP	Ending MP	Crest or Sag	Approximate Existing Sight Distance (ft)	Sight Distance (ft) Current Design Guidelines
1	Anderson	0.00	0.12	Crest	452	360
2		0.16	0.19	Sag	292	360
3		0.26	0.36	Sag	1625	360
4		0.49	0.55	Crest	1915	360
5		0.57	0.68	Sag	713	360
6		0.73	0.79	Crest	1006	360
7		0.94	1.01	Crest	437	360
8		1.07	1.14	Sag	451	360
9		1.22	1.34	Crest	621	360
10		1.38	1.45	Sag	376	360
11		1.50	1.54	Crest	405	250
12		1.62	1.64	Crest	2485	250
13		1.65	1.69	Sag	892	250
14		1.71	1.75	Crest	521	250
15		1.77	1.81	Sag	726	250
16		1.86	1.90	Sag	2689	250
17		1.93	1.95	Crest	466	250
18		1.97	2.03	Sag	293	495
19		2.04	2.09	Crest	415	495
20		2.13	2.19	Crest	363	495
21		2.21	2.29	Sag	215	495
22		2.31	2.37	Crest	309	495
23		2.39	2.42	Sag	331	495
24		2.51	2.57	Crest	362	495
25		2.59	2.63	Sag	1153	495
26		2.68	2.70	Crest	1499	495
27		2.73	2.81	Sag	387	495
28		2.99	3.04	Crest	285	495
29		3.15	3.28	Sag	432	495
30		3.31	3.33	Crest	867	495
31		3.35	3.38	Sag	440	495
32		3.41	3.42	Crest	789	495
33		3.47	3.54	Crest	309	495
34		3.61	3.67	Sag	227	495
35		3.68	3.72	Crest	427	495
36		3.72	3.80	Sag	418	495
37		3.96	4.01	Crest	350	495
38		4.12	4.15	Crest	1140	495
39		4.22	4.37	Sag	867	495
40		4.56	4.59	Crest	637	495
41	Franklin	0.24	0.30	Sag	13930	495
42		0.46	0.55	Sag	475	495
43		0.92	1.07	Crest	593	495
44		1.21	1.24	Crest	804	495
45		1.73	1.83	Sag	435	495
46		1.86	1.99	Crest	458	495

Denotes curves that were analyzed

Ball-Bank Indicator Analysis

Observers: KYTC HSIP

Date: 8/8/2016

County: Anderson

Route: KY 151

Posted Speed: 55/45/35 mph

Travel Direction: (see below)

Ball-Bank Indicator Readings (degrees)											
Curve ID Milepoint	Curve Milepoint (rounded)	Travel Direction	Speed on Curve (mph)							Advisory Speed (mph)	Remarks
			55	50	45	40	35	30	25		
0.126 to 0.019	0.1	South	-	20.50	15.20	12.38	8.93	-	-	35	45 mph zone – no curve sign but US 127 intersection is near
1.485 to 1.380	1.5	South	15.60	12.40	10.80					45	45 mph zone – borderline reading, could be 50 mph advisory with tube ball-bank or different vehicle
1.652 to 1.585	1.7	South	10.80	-						50	35 mph zone
2.608 to 2.508	2.6	South	9.20	9.00						55	
2.935 to 2.865	3.0	South	8.60	8.00						55	
4.421 to 4.265	4.4	South	7.40	5.20						55	
0.126 to 0.019	0.1	North	-	-	-	-	-	-	-	-	Intersection
1.485 to 1.380	1.5	North	9.10	7.10						55	45 mph zone
1.652 to 1.585	1.7	North	9.98	9.72						55	35 mph zone
2.608 to 2.508	2.6	North	12.30	7.40						55	
2.935 to 2.865	3.0	North	9.30	7.00						55	
4.421 to 4.265	4.4	North	5.85	4.00						55	

Note: An alarm sounds when the ball-bank indicator reaches the following readings:

1. 16 degrees of ball-bank for speeds of 20 mph or less
2. 14 degrees of ball-bank for speeds of 25 to 30 mph
3. 12 degrees of ball-bank for speeds of 35 mph and higher

Curve Warning Sign Inventory				
County	Posted Speed (mph)	Milepoint	Northbound	Southbound
Anderson	45	1.4		
		1.5		
	55	2.4		
	55	2.8		
		2.8		
	55	4.2		

Rumble Strip Inventory				
County	Posted Speed (mph)	Rumble Strip	Begin MP	End MP
Anderson	45	No rumble strip	0.00	1.473
	35 to 45 (Alton)	Rumble strip on roadway edges and centerline	1.473	1.990
	55	Rumble strip on roadway edges and centerline	1.990	4.587
Franklin	55	Rumble strip on roadway edges and centerline	0.00	2.30

Appendix D

Crash Records

0.1 Mile Spot Crash Analysis

0.3 Mile Spot Crash Analysis

Section/Segment Crash Analysis

Crash Records: Section 1 – KY 151: From US 127 (MP 0) to the Florida Tile Entrance (MP 0.477)
Anderson County
January 1, 2010, and December 31, 2015

* **KABCP** K = Fatal Injury P = Property Damage Only
A = Incapacitating Injury
B = Non-incapacitating Injury
C = Possible Injury

	Milepoint	Predominant Crash Type	Year	Month	Day	Direction of Travel	Roadway Condition	WEATHER	CMV Indicator	Vehicle Type	Precollision Action	Indicators							*KABCP	KABCP Number
												Alcohol	Distracted	Drowsy	Drugs	Speeding	Deer	Night		
1	0	Rear End	2010	2	15	South	Snow/Slush	Snowing	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
2	0	Rear End	2010	11	12	East	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
3	0	Backing	2011	5	23	South	Dry	Clear	No	Passenger Car	Backing	No	Yes	No	No	No	No	No	P	1
4	0.001	Rear End	2010	1	20	South	Wet	Raining	No	Passenger Car	Making Right Turn	No	Yes	No	No	No	No	No	P	1
5	0.001	Rear End	2010	9	22	East	Dry	Clear	No	Passenger Car	Making Right Turn	No	Yes	No	No	No	No	No	P	1
6	0.001	Rear End	2012	1	21	South	Wet	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Making Right Turn	No	Yes	No	No	No	No	No	P	1
7	0.001	Rear End	2013	3	10	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	Yes	P	1
8	0.001	Rear End	2014	12	26	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Starting in Traffic	No	Yes	No	No	No	No	Yes	P	1
9	0.003	Rear End	2011	7	17	East	Wet	Cloudy	No	Passenger Car	Making Right Turn	No	No	No	No	No	No	No	P	1
10	0.003	Rear End	2014	8	2	East	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
11	0.003	Rear End	2011	7	12	South	Wet	Cloudy	No	Passenger Car	Making Right Turn	No	No	No	No	No	No	No	P	1
12	0.005	Rear End	2011	10	13	East	Wet	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Making Right Turn	No	Yes	No	No	No	No	No	P	1
13	0.008	Rear End	2010	4	3		Dry	Cloudy	No	Passenger Car		No	No	No	No	No	No	No	P	1
14	0.009	Rear End	2010	3	23	South	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
15	0.009	Rear End	2012	1	27	South	Wet	Cloudy	No	Passenger Car	Starting from Parking	No	Yes	No	No	No	No	No	P	1
16	0.01	Rear End	2011	11	22	East	Wet	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Slowing or Stopped	No	Yes	No	No	No	No	No	P	1
17	0.013	Rear End	2013	6	25	South	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Starting in Traffic	No	Yes	No	No	No	No	No	P	1
18	0.013	Rear End	2015	8	14	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Right Turn	No	No	No	No	No	No	No	P	1
19	0.014	Sideswipe-Same Direction	2012	6	26	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Right Turn	No	Yes	No	No	No	No	No	C	2
20	0.014	Rear End	2014	2	1	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Right Turn	No	No	No	No	No	No	No	P	1
21	0.014	Rear End	2014	6	22	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	C	2
22	0.014	Rear End	2014	6	27	East	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
23	0.014	Rear End	2015	5	16	East	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
24	0.015	Rear End	2015	1	7	South	Dry	Clear	No	Passenger Car	Slowing or Stopped	No	No	No	No	No	No	No	P	1
25	0.016	Rear End	2013	8	16	South	Dry	Clear	No	Passenger Car	Making Right Turn	No	No	No	No	No	No	No	P	1
26	0.016	Rear End	2013	10	7	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Slowing or Stopped	No	Yes	No	No	No	No	No	P	1
27	0.017	Rear End	2015	10	13	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
28	0.019	Rear End	2012	9	4	South	Dry	Cloudy	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
29	0.021	Rear End	2012	3	14	South	Dry	Clear	No	Passenger Car	Stopped in Traffic	No	No	No	No	No	No	No	P	1
30	0.036	Rear End	2012	6	25	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	C	2
31	0.04	Rear End	2015	3	20	East	Dry	Clear	No	Passenger Car	Going Straight Ahead	Yes	No	No	No	No	No	No	P	1
32	0.064	Head On	2013	6	9	East	Wet	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	B	3
33	0.09	Single Vehicle	2013	3	24	East	Dry	Clear	No	Passenger Car	Going Straight Ahead	Yes	No	No	No	No	No	Yes	C	2
34	0.104	Rear End	2010	2	15	North	ICE	Blowing Sanc	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	Yes	P	1
35	0.107	Angle	2010	11	16	West	Wet	Raining	No	Passenger Car	Making Right Turn	No	No	No	No	No	No	No	P	1
36	0.109	Rear End	2012	9	22	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
37	0.109	Head On	2013	4	19	South	Dry	Clear	No	Passenger Car	Making Left Turn	No	No	No	No	No	No	No	P	1
38	0.11	Rear End	2010	1	9	North	Snow/Slush	Snowing	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	Yes	B	3
39	0.111	Rear End	2013	5	24	West	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
40	0.118	Angle	2011	9	6	North	Dry	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
41	0.157	Single Vehicle	2012	10	20	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
42	0.178	Single Vehicle	2011	3	26	South	Dry	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
43	0.232	Rear End	2011	9	6	South	Wet	Cloudy	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
44	0.244	Sideswipe-Opposite Direction	2010	9	24	North	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
45	0.268	Single Vehicle	2013	11	16	North	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
46	0.342	Rear End	2015	12	24	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
47	0.474	Rear End	2014	12	15	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1

*48	1.765	Rear End	2010	4	28	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1

*After reviewing the crash report narratives, it was determined that this crash was located incorrectly in Section 4. The crash occurred at the intersection of US 127 and KY 151 in Section 1.

Crash Records: Section 2 – KY 151: From the Florida Tile Entrance (MP 0.477) to Alton (MP 1.473)
Anderson County
January 1, 2010, and December 31, 2015

	Milepoint	Predominant Crash Type	Year	Month	Day	Direction of Travel	Roadway Condition	WEATHER	CMV Indicator	Vehicle Type	Precollision Action	Indicators							*KABCP	KABCP Number
												Alcohol	Distracted	Drowsy	Drugs	Speeding	Deer	Night		
1	0.479	Rear End	2014	2	8	North	Wet	Cloudy	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	B	3
2	0.494	Angle	2011	10	3	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	B	3
3	0.505	Sideswipe-Opposite Direction	2014	6	28	North	Wet	Raining	No	Passenger Car	Backing	No	No	No	No	No	No	No	P	1
4	0.519	Rear End	2012	3	2	East	Wet	Cloudy	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	Yes	P	1
5	0.565	Angle	2012	2	23	East	Wet	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	P	1
6	0.572	Rear End	2011	3	29	South	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
7	0.595	Single Vehicle	2012	10	2	South	Dry	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	A	4
8	0.64	Single Vehicle	2013	11	11	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	Yes	No	No	Yes	C	2
9	0.784	Single Vehicle	2014	4	25	North	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
10	0.788	Single Vehicle	2012	11	12	North	Wet	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	C	2
11	0.831	Rear End	2015	4	5	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
12	0.837	Sideswipe-Opposite Direction	2014	7	28	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1
13	0.856	Rear End	2014	8	5	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
14	0.86	Opposing Left Turn	2010	2	11	North	Dry	Clear	No	Passenger Car	Making Left Turn	No	No	No	No	No	No	No	C	2
15	0.86	Angle	2014	7	3	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	P	1
16	0.86	Opposing Left Turn	2015	7	31	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	No	No	No	No	No	No	P	1
17	0.863	Opposing Left Turn	2013	12	15	North	Dry	Clear	No	Passenger Car	Making Left Turn	No	Yes	No	No	No	No	Yes	P	1
18	0.873	Sideswipe-Same Direction	2014	6	2	South	Dry	Clear	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
19	0.933	Sideswipe-Opposite Direction	2012	3	1	North	Dry	Clear	No	Passenger Car	Avoiding Object in Roadway	No	No	No	No	No	No	No	P	1
20	0.94	Single Vehicle	2013	12	10	North	Snow/Slush	Snowing	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1
21	1.078	Single Vehicle	2011	6	15	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
22	1.265	Rear End	2012	5	1	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
23	1.45	Rear End	2010	9	29	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1

* **KABCP**
K = Fatal Injury
A = Incapacitating Injury
B = Non-incapacitating Injury
C = Possible Injury
P = Property Damage Only

Crash Records: Section 3 – KY 151: The town of Alton (MP 1.473 to MP 1.990)
Anderson County
January 1, 2010, and December 31, 2015

	Milepoint	Predominant Crash Type	Year	Month	Day	Direction of Travel	Roadway Condition	WEATHER	CMV Indicator	Vehicle Type	Precollision Action	Indicators							*KABCP	KABCP Number
												Alcohol	Distracted	Drowsy	Drugs	Speeding	Deer	Night		
1	1.509	Angle	2013	5	4	West	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	P	1
2	1.547	Opposing Left Turn	2015	8	12	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	No	No	No	No	No	No	P	1
3	1.679	Rear End	2013	9	25	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	B	3
4	1.703	Single Vehicle	2010	5	5	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
5	1.705	Angle	2015	1	4	North	Dry	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	Yes	No	No	No	Yes	B	3
6	1.763	Angle	2011	7	24	West	Dry	Clear	No	Passenger Car	Making Left Turn	No	No	No	No	No	No	No	P	1
*	1.765	Rear End	2010	4	28	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
7	1.879	Rear End	2012	8	27	North	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
8	1.931	Single Vehicle	2013	5	22	South	Dry	Clear	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	No	B	3
9	1.947	Rear End	2012	6	11	South	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1
10	1.957	Single Vehicle	2015	7	19	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	B	3

*After reviewing the crash report narratives, it was determined that this crash is located incorrectly. The crash occurred at the intersection of US 127 and KY 151 in Section 1.

* **KABCP**
K = Fatal Injury
A = Incapacitating Injury
B = Non-incapacitating Injury
C = Possible Injury
P = Property Damage Only

Crash Records: Section 4 - KY 151: 55 mph north of Alton (MP 1.990) to the change in pavement section (MP 4.150)
Anderson County
January 1, 2010, and December 31, 2015

* **KABCP:** K = Fatal Injury
A = Incapacitating Injury
B = Non-incapacitating Injury
C = Possible Injury
P = Property Damage Only

	Milepoint	Predominant Crash Type	Year	Month	Day	Direction of Travel	Roadway Condition	WEATHER	CMV Indicator	Vehicle Type	Precollision Action	Indicators							*KABCP	KABCP Number
												Alcohol	Distracted	Drowsy	Drugs	Speeding	Deer	Night		
1	2.013	Single Vehicle	2014	6	24	South	Dry	Cloudy	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	No	No	No	No	No	No	P	1
2	2.043	Single Vehicle	2015	8	18	South	Dry	Clear	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	No	No	No	No	No	No	C	2
3	2.061	Single Vehicle	2015	3	12	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1
4	2.069	Single Vehicle	2015	5	14	South	Dry	Clear	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	Yes	No	No	No	Yes	A	4
5	2.195	Single Vehicle	2014	10	9	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
6	2.277	Single Vehicle	2011	2	7	South	Snow/Slush	Snowing	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
7	2.281	Single Vehicle	2011	11	4	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
8	2.316	Single Vehicle	2010	12	17	North	ICE	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
9	2.328	Single Vehicle	2012	2	19	North	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	B	3
10	2.551	Single Vehicle	2014	10	26	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
11	2.567	Single Vehicle	2011	12	30	South	Dry	Severe Cross	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	No	B	3
12	2.596	Single Vehicle	2015	3	4	North	Snow/Slush	Snowing	Yes	Truck, Trailer	Going Straight Ahead	No	No	No	No	No	No	No	P	1
13	2.617	Sideswipe-Opposite Direction	2010	5	26	North	Dry	Clear	No	Truck, Trailer	Going Straight Ahead	No	No	No	No	No	No	No	P	1
14	2.715	Single Vehicle	2011	12	4	West	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
15	2.751	Single Vehicle	2010	2	15	North	Snow/Slush	Blowing Sanc	Yes	Truck, Trailer	Going Straight Ahead	No	No	No	No	Yes	No	No	P	1
16	2.811	Single Vehicle	2013	12	22	North	Wet	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
17	2.836	Single Vehicle	2010	2	10	South	Snow/Slush	Blowing Sanc	No	Light truck (Van/Sports Utility/Pickup)	Entering Parked Position	No	No	No	No	No	No	No	P	1
18	3.014	Single Vehicle	2014	1	26	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	Yes	Yes	No	No	No	No	Yes	P	1
19	3.024	Angle	2013	6	27	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Leaving Traffic Lane	No	No	No	No	No	No	No	P	1
20	3.128	Rear End	2015	3	2	South	Dry	Cloudy	No	Passenger Car	Slowing or Stopped	No	Yes	No	No	No	No	No	P	1
21	3.219	Single Vehicle	2011	12	9	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
22	3.229	Backing	2010	1	25	South	Dry	Cloudy	No	Truck, Trailer	Backing	No	Yes	No	No	No	No	No	P	1
23	3.491	Rear End	2013	12	20	North	Wet	Cloudy	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
24	3.62	Single Vehicle	2014	3	5	North	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	Yes	No	P	1
25	3.65	Single Vehicle	2010	8	1	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	Yes	No	No	No	No	P	1
26	3.657	Single Vehicle	2015	10	18	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
27	3.707	Single Vehicle	2015	7	21	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	No	P	1
28	3.746	Rear End	2010	5	26	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
29	3.798	Rear End	2010	10	6	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
30	3.836	Single Vehicle	2015	2	19	South	Wet	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
31	3.847	Single Vehicle	2015	11	16	South	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
32	3.893	Single Vehicle	2014	1	4	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	Yes	No	P	1
33	3.962	Single Vehicle	2010	12	16	South	ICE	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
34	3.983	Single Vehicle	2014	1	3	South	Dry	Clear	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
35	4.067	Rear End	2010	3	28	South	Wet	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
36	4.101	Sideswipe-Opposite Direction	2015	10	12	South	Dry	Clear	Yes	Truck, Trailer	Leaving Traffic Lane	No	Yes	No	No	No	No	Yes	A	4
37	4.143	Head On	2011	10	7	North	Dry	Clear	No	Truck, Trailer	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2

Note: these are two CMV crashes incorrectly located in Section 5 that belong in Section 4

38	4.37	Single Vehicle	2015	10	12	South	Dry	Cloudy	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	Yes	P	1
39	4.44	Single Vehicle	2013	4	29	South	Dry	Clear	Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	No	No	No	No	No	No	P	1

Crash Records: Section 5 – KY 151: The change in pavement section (MP 4.150, Anderson Co.) to I-64 (MP 2.3, Franklin Co.)
Anderson and Franklin County
January 1, 2010, and December 31, 2015

* **KABCP:** K = Fatal Injury; A = Incapacitating Injury; B = Non-incapacitating Injury; C = Possible Injury; P = Property Damage Only

	Milepoint	Predominant Crash Type	Year	Month	Day	Direction of Travel	Roadway Condition	WEATHER	CMV Indicator	Vehicle Type	Precollision Action	Indicators							*KABCP	KABCP Number
												Alcohol	Distracted	Drowsy	Drugs	Speeding	Deer	Night		
1	4.277	Single Vehicle	2013	5	5	South	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	Yes	No	Yes	P	1
2	4.297	Angle	2015	11	2	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	Yes	Yes	No	No	No	No	No	P	1
**	4.37	Single Vehicle	2015	10	12	South	Dry	Cloudy	**Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	Yes	No	No	No	No	Yes	P	1
3	4.383	Single Vehicle	2010	7	1	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	Yes	No	No	No	No	P	1
**	4.44	Single Vehicle	2013	4	29	South	Dry	Clear	**Yes	Truck Tractor, Semi-Trailer	Going Straight Ahead	No	No	No	No	No	No	No	P	1
4	0.025	Angle	2014	6	20	South	Wet	Raining	No	Passenger Car	Overtaking	No	Yes	No	No	No	No	No	P	1
5	0.059	Single Vehicle	2012	2	29	South	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	B	3
6	0.063	Sideswipe-Same Direction	2015	3	3	East	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Overtaking	No	Yes	No	No	No	No	No	P	1
7	0.075	Sideswipe-Same Direction	2014	4	28	South	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Leaving Traffic Lane	No	Yes	No	No	No	No	No	C	2
8	0.082	Single Vehicle	2012	10	20	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
9	0.09	Single Vehicle	2014	8	23	South	Wet	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Avoiding Object in Roadway	No	No	No	No	No	No	No	P	1
10	0.092	Rear End	2012	11	27	North	Wet	Cloudy	Yes	Passenger Car	Going Straight Ahead	No	Yes	No	No	Yes	No	No	B	3
11	0.178	Sideswipe-Opposite Direction	2010	1	15	North	Dry	Cloudy	Yes	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1
12	0.306	Opposing Left Turn	2015	6	7	East	Dry	Clear	No	Passenger Car	Making Left Turn	No	Yes	No	No	No	No	No	P	1
13	0.397	Rear End	2015	5	3	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
14	0.487	Angle	2013	10	8	North	Dry	Clear	No	Passenger Car	Making Left Turn	No	Yes	No	No	No	No	No	P	1
15	0.507	Single Vehicle	2012	12	5	South	Dry	Fog	No	Truck-Single Unit	Going Straight Ahead	No	No	No	No	No	No	No	C	2
16	0.598	Head On	2010	9	5	South	Dry	Clear	No	Passenger Car	Overtaking	No	Yes	No	No	No	No	No	C	2
17	0.599	Sideswipe-Same Direction	2010	11	25	South	Wet	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
18	0.608	Angle	2010	12	9	South	Dry	Cloudy	Yes	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	B	3
19	0.628	Single Vehicle	2013	11	26	North	Wet	Sleet/Hail	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	No	P	1
20	0.629	Single Vehicle	2015	1	28	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
21	0.712	Single Vehicle	2015	12	26	South	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	Yes	No	No	P	1
22	0.741	Single Vehicle	2014	4	1	North	Wet	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
23	1.022	Single Vehicle	2011	8	20	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
24	1.118	Single Vehicle	2015	9	28	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
25	1.174	Single Vehicle	2011	12	29	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	No	P	1
26	1.225	Single Vehicle	2014	6	1	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
27	1.455	Single Vehicle	2011	1	16	North	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
28	1.647	Single Vehicle	2011	3	30	North	Dry	Cloudy	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
29	1.649	Single Vehicle	2015	3	20	North	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
30	1.673	Single Vehicle	2012	6	23	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
31	1.679	Sideswipe-Opposite Direction	2015	7	18	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Other	No	No	No	No	No	No	No	P	1
32	1.705	Backing	2014	8	6	West	Dry	Clear	Yes	Truck-other Combination	Backing	No	Yes	No	No	No	No	No	P	1
33	1.711	Single Vehicle	2013	12	14	North	Wet	Raining	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	Yes	P	1
34	1.72	Single Vehicle	2013	2	3	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
35	1.761	Sideswipe-Opposite Direction	2012	9	28	North	Wet	Raining	Yes	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	No	No	No	No	No	Yes	B	3
36	1.767	Single Vehicle	2014	12	15	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
37	1.868	Rear End	2013	1	29	South	Wet	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	C	2
38	1.869	Angle	2014	7	5	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	P	1
39	1.875	Angle	2015	8	3	West	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1
40	1.878	Sideswipe-Same Direction	2013	7	4	South	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Entering Parked Position	No	Yes	No	No	No	No	No	P	1
41	1.884	Angle	2010	5	28	East	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Starting from Parking	No	No	No	No	No	No	No	P	1
42	1.889	Opposing Left Turn	2010	5	24	West	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	C	2
43	1.89	Angle	2012	9	23	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Right Turn	No	Yes	No	No	No	No	No	P	1
44	1.897	Angle	2012	6	22	South	Dry	Clear	Yes	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	No	No	No	No	No	No	P	1
45	1.903	Single Vehicle	2012	11	7	West	Wet	Raining	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	Yes	Yes	P	1
46	1.906	Rear End	2010	7	22	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	No	No	P	1
47	1.907	Single Vehicle	2014	3	11	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	No	No	No	No	P	1
48	1.911	Single Vehicle	2012	1	4	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Going Straight Ahead	No	No	No	No	No	Yes	No	P	1
49	1.921	Single Vehicle	2013	2	21	North	Wet	Snowing	No	Passenger Car	Making Left Turn	No	No	No	No	No	No	Yes	P	1
50	1.941	Opposing Left Turn	2011	5	29	North	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	C	2
51	1.949	Opposing Left Turn	2015	7	11	East	Dry	Cloudy	No	Passenger Car	Making Left Turn	No	Yes	No	No	No	No	Yes	C	2
52	1.968	Single Vehicle	2014	7	11	South	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	No	Yes	No	No	No	P	1
53	1.999	Angle	2010	4	24	East	Dry	Cloudy	No	Light truck (Van/Sports Utility/Pickup)	Making Left Turn	No	Yes	No	No	No	No	No	P	1
54	2.077	Single Vehicle	2015	12	16	South	Dry	Clear	No	Light truck (Van/Sports Utility/Pickup)	Merging	No	No	No	No	No	No	Yes	P	1
55	2.276	Single Vehicle	2013	10	29	West	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	No	Yes	No	No	No	No	P	1
56	2.277	Rear End	2012	12	7	North	Wet	Raining	No	Passenger Car	Slowing or Stopped	No	Yes	No	No	No	No	Yes	P	1
57	2.284	Angle	2010	10	25	West	Dry	Clear	No	Passenger Car	Going Straight Ahead	No	Yes	No	No	No	No	No	P	1

** After reviewing the crash report narratives, it was determined that these two crashes are located incorrectly. They occurred in Section 4.

0.1 Mile Spot Crash Analysis

County	Beginning Milepoint	Ending Milepoint	Length (miles)	AADT (vpd)	Number of lanes	Rural/ Urban	Functional Class Rate	Crashes				MV	Critical Crash Rate (RC)	Total Crash Rate	CCRF
								Fatal	Injury	PDO	Total				
Anderson County	0.0	0.1	0.1	7,153	2	Urban	0.51	0	5	28	33	15.67	1.01	2.11	2.09
	0.1	0.2	0.1	7,153	2	Urban	0.51	0	1	8	9	15.67	1.01	0.57	0.57
	0.2	0.3	0.1	7,153	2	Urban	0.51	0	1	2	3	15.67	1.01	0.19	0.19
	0.3	0.4	0.1	7,153	2	Urban	0.51	0	1	0	1	15.67	1.01	0.06	0.06
	0.4	0.5	0.1	7,153	2	Urban	0.51	0	2	1	3	15.67	1.01	0.19	0.19
	0.5	0.6	0.1	7,153	2	Urban	0.51	0	2	3	5	15.67	1.01	0.32	0.32
	0.6	0.7	0.1	7,153	2	Urban	0.51	0	1	0	1	15.67	1.01	0.06	0.06
	0.7	0.8	0.1	7,153	2	Urban	0.51	0	1	1	2	15.67	1.01	0.13	0.13
	0.8	0.9	0.1	7,153	2	Urban	0.51	0	2	6	8	15.67	1.01	0.51	0.51
	0.9	1.0	0.1	7,153	2	Urban	0.51	0	0	2	2	15.67	1.01	0.13	0.13
	1.0	1.1	0.1	7,153	2	Urban	0.51	0	0	1	1	15.67	1.01	0.06	0.06
	1.1	1.2	0.1	7,153	2	Urban	0.51	0	0	0	0	15.67	1.01	0.00	0.00
	1.2	1.3	0.1	7,153	2	Urban	0.51	0	0	1	1	15.67	1.01	0.06	0.06
	1.3	1.4	0.1	7,153	2	Urban	0.51	0	0	0	0	15.67	1.01	0.00	0.00
	1.4	1.5	0.1	7,153	2	Urban	0.51	0	0	1	1	15.67	1.01	0.06	0.06
	1.5	1.6	0.1	7,153	2	Rural	0.26	0	0	2	2	15.67	0.62	0.13	0.20
	1.6	1.7	0.1	7,153	2	Rural	0.26	0	1	0	1	15.67	0.62	0.06	0.10
	1.7	1.8	0.1	7,153	2	Rural	0.26	0	1	3	4	15.67	0.62	0.26	0.41
	1.8	1.9	0.1	4,588	2	Rural	0.26	0	0	1	1	10.05	0.72	0.10	0.14
	1.9	2.0	0.1	4,588	2	Rural	0.26	0	2	1	3	10.05	0.72	0.30	0.41
	2.0	2.1	0.1	4,588	2	Rural	0.26	0	2	2	4	10.05	0.72	0.40	0.55
	2.1	2.2	0.1	4,588	2	Rural	0.26	0	0	1	1	10.05	0.72	0.10	0.14
	2.2	2.3	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	2.3	2.4	0.1	4,588	2	Rural	0.26	0	1	1	2	10.05	0.72	0.20	0.27
	2.4	2.5	0.1	4,588	2	Rural	0.26	0	0	0	0	10.05	0.72	0.00	0.00
	2.5	2.6	0.1	4,588	2	Rural	0.26	0	1	2	3	10.05	0.72	0.30	0.41
	2.6	2.7	0.1	4,588	2	Rural	0.26	0	0	1	1	10.05	0.72	0.10	0.14
	2.7	2.8	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	2.8	2.9	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	2.9	3.0	0.1	4,588	2	Rural	0.26	0	0	0	0	10.05	0.72	0.00	0.00
	3.0	3.1	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	3.1	3.2	0.1	4,588	2	Rural	0.26	0	0	1	1	10.05	0.72	0.10	0.14
	3.2	3.3	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	3.3	3.4	0.1	4,588	2	Rural	0.26	0	0	0	0	10.05	0.72	0.00	0.00
	3.4	3.5	0.1	4,588	2	Rural	0.26	0	1	0	1	10.05	0.72	0.10	0.14
	3.5	3.6	0.1	4,588	2	Rural	0.26	0	0	0	0	10.05	0.72	0.00	0.00
	3.6	3.7	0.1	4,588	2	Rural	0.26	0	0	3	3	10.05	0.72	0.30	0.41
	3.7	3.8	0.1	4,588	2	Rural	0.26	0	0	3	3	10.05	0.72	0.30	0.41
	3.8	3.9	0.1	4,588	2	Rural	0.26	0	0	3	3	10.05	0.72	0.30	0.41
	3.9	4.0	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	4.0	4.1	0.1	4,588	2	Rural	0.26	0	0	1	1	10.05	0.72	0.10	0.14
	4.1	4.2	0.1	4,588	2	Rural	0.26	0	2	2	4	10.05	0.72	0.40	0.55
	4.2	4.3	0.1	4,588	2	Rural	0.26	0	0	2	2	10.05	0.72	0.20	0.27
	4.3	4.4	0.1	4,588	2	Rural	0.26	0	0	1	1	10.05	0.72	0.10	0.14
	4.4	4.5	0.1	4,588	2	Rural	0.26	0	0	0	0	10.05	0.72	0.00	0.00
	4.5	0.022	0.1	4,588	2	Rural	0.26	0	0	0	0	10.05	0.72	0.00	0.00
Franklin County	0.022	0.122	0.1	5,215	2	Rural	0.26	0	3	4	7	11.42	0.69	0.61	0.89
	0.122	0.222	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	0.222	0.322	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	0.322	0.422	0.1	5,215	2	Rural	0.26	0	1	0	1	11.42	0.69	0.09	0.13
	0.422	0.522	0.1	5,215	2	Rural	0.26	0	1	1	2	11.42	0.69	0.18	0.25
	0.522	0.622	0.1	5,215	2	Rural	0.26	0	2	1	3	11.42	0.69	0.26	0.38
	0.622	0.722	0.1	5,215	2	Rural	0.26	0	0	3	3	11.42	0.69	0.26	0.38
	0.722	0.822	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	0.822	0.922	0.1	5,215	2	Rural	0.26	0	0	0	0	11.42	0.69	0.00	0.00
	0.922	1.022	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	1.022	1.122	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	1.122	1.222	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	1.222	1.322	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	1.322	1.422	0.1	5,215	2	Rural	0.26	0	0	0	0	11.42	0.69	0.00	0.00
	1.422	1.522	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	1.522	1.622	0.1	5,215	2	Rural	0.26	0	0	0	0	11.42	0.69	0.00	0.00
	1.622	1.722	0.1	5,215	2	Rural	0.26	0	0	7	7	11.42	0.69	0.61	0.89
	1.722	1.822	0.1	5,215	2	Rural	0.26	0	1	1	2	11.42	0.69	0.18	0.25
	1.822	1.922	0.1	5,215	2	Rural	0.26	0	2	11	13	11.42	0.69	1.14	1.64
	1.922	2.022	0.1	5,215	2	Rural	0.26	0	2	7	9	11.42	0.69	0.79	1.14
	2.022	2.122	0.1	5,215	2	Rural	0.26	0	0	1	1	11.42	0.69	0.09	0.13
	2.122	2.222	0.1	5,215	2	Rural	0.26	0	2	2	4	11.42	0.69	0.35	0.51
	2.222	2.322	0.1	5,215	2	Rural	0.26	0	0	4	4	11.42	0.69	0.35	0.51

CCRF exceeds or approaches 1.0 which indicates crashes may be occurring more often than what can be attributed to random occurrence

The following data was used for the CRF calculations:

*Crash data: January 1, 2010 through December 31, 2015, 6 years

*3-year crash rate (2012-2014, crashes per million vehicle miles per 0.1-mile spot)

*Most current, pre-STAA ban AADT; either 2013 or 2014 AADT

* the pre STAA ban data was used to maintain consistency with the available crash records and most recent crash rates

MV: Million vehicles

RC: Kentucky Transportation Center, *The Analysis of Traffic Crash Data in Kentucky (2010-2014)*

CCRF: Critical Crash Rate Factor

0.3 Mile Spot Crash Analysis

County	Beginning Milepoint	Ending Milepoint	Length (miles)	AADT (vpd)	Number of lanes	Rural/ Urban	Functional Class Rate	Crashes				MV	Critical Crash Rate (RC)	Actual Crash Rate	CCRF
								Fatal	Injury	PDO	Total				
Anderson County	0.0	0.3	0.3	7,153	2	Urban	1.53	0	7	38	45	15.67	2.37	2.87	1.21
	0.1	0.4	0.3	7,153	2	Urban	1.53	0	4	10	14	15.67	2.37	0.89	0.38
	0.2	0.5	0.3	7,153	2	Urban	1.53	0	4	3	7	15.67	2.37	0.45	0.19
	0.3	0.6	0.3	7,153	2	Urban	1.53	0	5	4	9	15.67	2.37	0.57	0.24
	0.4	0.7	0.3	7,153	2	Urban	1.53	0	5	4	9	15.67	2.37	0.57	0.24
	0.5	0.8	0.3	7,153	2	Urban	1.53	0	4	4	8	15.67	2.37	0.51	0.22
	0.6	0.9	0.3	7,153	2	Urban	1.53	0	4	7	11	15.67	2.37	0.70	0.30
	0.7	1.0	0.3	7,153	2	Urban	1.53	0	3	9	12	15.67	2.37	0.77	0.32
	0.8	1.1	0.3	7,153	2	Urban	1.53	0	2	9	11	15.67	2.37	0.70	0.30
	0.9	1.2	0.3	7,153	2	Urban	1.53	0	0	3	3	15.67	2.37	0.19	0.08
	1.0	1.3	0.3	7,153	2	Urban	1.53	0	0	2	2	15.67	2.37	0.13	0.05
	1.1	1.4	0.3	7,153	2	Urban	1.53	0	0	1	1	15.67	2.37	0.06	0.03
	1.2	1.5	0.3	7,153	2	Urban	1.53	0	0	2	2	15.67	2.37	0.13	0.05
	1.3	1.6	0.3	7,153	2	Urban	1.53	0	0	3	3	15.67	2.37	0.19	0.08
	1.4	1.7	0.3	7,153	2	Rural	0.78	0	1	3	4	15.67	1.39	0.26	0.18
	1.5	1.8	0.3	7,153	2	Rural	0.78	0	2	5	7	15.67	1.39	0.45	0.32
	1.6	1.9	0.3	7,153	2	Rural	0.78	0	2	4	6	15.67	1.39	0.38	0.28
	1.7	2.0	0.3	7,153	2	Rural	0.78	0	3	5	8	15.67	1.39	0.51	0.37
	1.8	2.1	0.3	4,588	2	Rural	0.78	0	4	4	8	10.05	1.55	0.80	0.51
	1.9	2.2	0.3	4,588	2	Rural	0.78	0	4	4	8	10.05	1.55	0.80	0.51
	2.0	2.3	0.3	4,588	2	Rural	0.78	0	2	5	7	10.05	1.55	0.70	0.45
	2.1	2.4	0.3	4,588	2	Rural	0.78	0	1	4	5	10.05	1.55	0.50	0.32
	2.2	2.5	0.3	4,588	2	Rural	0.78	0	1	3	4	10.05	1.55	0.40	0.26
	2.3	2.6	0.3	4,588	2	Rural	0.78	0	2	3	5	10.05	1.55	0.50	0.32
	2.4	2.7	0.3	4,588	2	Rural	0.78	0	1	3	4	10.05	1.55	0.40	0.26
	2.5	2.8	0.3	4,588	2	Rural	0.78	0	1	5	6	10.05	1.55	0.60	0.39
	2.6	2.9	0.3	4,588	2	Rural	0.78	0	0	5	5	10.05	1.55	0.50	0.32
	2.7	3.0	0.3	4,588	2	Rural	0.78	0	0	4	4	10.05	1.55	0.40	0.26
	2.8	3.1	0.3	4,588	2	Rural	0.78	0	0	4	4	10.05	1.55	0.40	0.26
	2.9	3.2	0.3	4,588	2	Rural	0.78	0	0	3	3	10.05	1.55	0.30	0.19
	3.0	3.3	0.3	4,588	2	Rural	0.78	0	0	5	5	10.05	1.55	0.50	0.32
	3.1	3.4	0.3	4,588	2	Rural	0.78	0	0	3	3	10.05	1.55	0.30	0.19
	3.2	3.5	0.3	4,588	2	Rural	0.78	0	1	2	3	10.05	1.55	0.30	0.19
	3.3	3.6	0.3	4,588	2	Rural	0.78	0	1	0	1	10.05	1.55	0.10	0.06
	3.4	3.7	0.3	4,588	2	Rural	0.78	0	1	3	4	10.05	1.55	0.40	0.26
	3.5	3.8	0.3	4,588	2	Rural	0.78	0	0	6	6	10.05	1.55	0.60	0.39
	3.6	3.9	0.3	4,588	2	Rural	0.78	0	0	9	9	10.05	1.55	0.90	0.58
	3.7	4.0	0.3	4,588	2	Rural	0.78	0	0	8	8	10.05	1.55	0.80	0.51
	3.8	4.1	0.3	4,588	2	Rural	0.78	0	0	6	6	10.05	1.55	0.60	0.39
	3.9	4.2	0.3	4,588	2	Rural	0.78	0	2	5	7	10.05	1.55	0.70	0.45
	4.0	4.3	0.3	4,588	2	Rural	0.78	0	2	5	7	10.05	1.55	0.70	0.45
	4.1	4.4	0.3	4,588	2	Rural	0.78	0	2	5	7	10.05	1.55	0.70	0.45
	4.2	4.5	0.3	4,588	2	Rural	0.78	0	0	5	5	10.05	1.55	0.50	0.32
	4.3	0.013	0.3	4,588	2	Rural	0.78	0	0	3	3	10.05	1.55	0.30	0.19
Franklin County	4.4	0.113	0.3	5,215	2	Rural	0.78	0	3	5	8	11.42	1.50	0.70	0.47
	4.5	0.213	0.3	5,215	2	Rural	0.78	0	3	5	8	11.42	1.50	0.70	0.47
	0.013	0.313	0.3	5,215	2	Rural	0.78	0	3	6	9	11.42	1.50	0.79	0.53
	0.113	0.413	0.3	5,215	2	Rural	0.78	0	1	2	3	11.42	1.50	0.26	0.18
	0.213	0.513	0.3	5,215	2	Rural	0.78	0	2	2	4	11.42	1.50	0.35	0.23
	0.313	0.613	0.3	5,215	2	Rural	0.78	0	4	2	6	11.42	1.50	0.53	0.35
	0.413	0.713	0.3	5,215	2	Rural	0.78	0	3	5	8	11.42	1.50	0.70	0.47
	0.513	0.813	0.3	5,215	2	Rural	0.78	0	2	5	7	11.42	1.50	0.61	0.41
	0.613	0.913	0.3	5,215	2	Rural	0.78	0	0	4	4	11.42	1.50	0.35	0.23
	0.713	1.013	0.3	5,215	2	Rural	0.78	0	0	2	2	11.42	1.50	0.18	0.12
	0.813	1.113	0.3	5,215	2	Rural	0.78	0	0	1	1	11.42	1.50	0.09	0.06
	0.913	1.213	0.3	5,215	2	Rural	0.78	0	0	3	3	11.42	1.50	0.26	0.18
	1.013	1.313	0.3	5,215	2	Rural	0.78	0	0	4	4	11.42	1.50	0.35	0.23
	1.113	1.413	0.3	5,215	2	Rural	0.78	0	0	3	3	11.42	1.50	0.26	0.18
	1.213	1.513	0.3	5,215	2	Rural	0.78	0	0	2	2	11.42	1.50	0.18	0.12
	1.313	1.613	0.3	5,215	2	Rural	0.78	0	0	1	1	11.42	1.50	0.09	0.06
	1.413	1.713	0.3	5,215	2	Rural	0.78	0	1	7	7	11.42	1.50	0.61	0.41
	1.513	1.813	0.3	5,215	2	Rural	0.78	0	1	8	9	11.42	1.50	0.79	0.53
	1.613	1.913	0.3	5,215	2	Rural	0.78	0	3	18	21	11.42	1.50	1.84	1.23
	1.713	2.013	0.3	5,215	2	Rural	0.78	0	5	16	21	11.42	1.50	1.84	1.23
	1.813	2.113	0.3	5,215	2	Rural	0.78	0	4	14	18	11.42	1.50	1.58	1.05
	1.913	2.213	0.3	5,215	2	Rural	0.78	0	2	4	6	11.42	1.50	0.53	0.35
	2.013	2.313	0.3	5,215	2	Rural	0.78	0	0	4	4	11.42	1.50	0.35	0.23

CCRF exceeds or approaches 1.0 which indicates crashes may be occurring more often than what can be attributed to random occurrence

The following data was used for the CRF calculations:

*Crash data: January 1, 2010 through December 31, 2015, 6 years

*3-year crash rate (2012-2014, crashes per million vehicle miles per 0.3-mile spot)

*Most current, pre-STAA ban AADT; either 2013 or 2014 AADT

* the pre STAA ban data was used to maintain consistency with the available crash records and most recent crash rates

MV: Million vehicles

RC: Kentucky Transportation Center, *The Analysis of Traffic Crash Data in Kentucky (2010-2014)*

CCRF: Critical Crash Rate Factor

Section/Segment Crash Analysis

County	Section	Beginning Milepoint	Ending Milepoint	Length (miles)	AADT (vpd)	Number of lanes	Rural/ Urban	Functional Class Rate	Crashes				HMVM	Critical Crash Rate (RC)	Actual Crash Rate	CCRF
									Fatal	Injury	PDO	Total				
Anderson	1	0.000	0.477	0.477	7,153	2	Urban	408	0	8	40	48	0.07	605	642.4	1.06
Anderson	2	0.477	1.473	0.996	7,153	2	Urban	408	0	8	15	23	0.16	543	147.4	0.27
Anderson/Franklin	3	1.473	1.990	0.517	4,588	2	Rural	280	0	4	6	10	0.05	479	192.5	0.40
Franklin	4	1.990	4.150	2.16	4,588	2	Rural	280	0	7	32	39	0.22	375	179.7	0.48
Franklin	5	4.150	2.300	2.737	5,215	2	Rural	280	0	12	45	57	0.31	359	182.3	0.51
Anderson	Urban	0.000	1.473	1.473	7,153	2	Urban	408	0	16	55	71	0.23	518	307.7	0.59
Anderson/Franklin	Rural	1.473	2.300	5.421	4,588	2	Rural	280	0	23	83	106	0.54	339	194.6	0.57
Full corridor	n/a	0.000 Anderson	2.300 Franklin	6.894	5,459	2	both	323		39	138	177	0.82	375	214.8	0.57

CCRF exceeds or approaches 1.0 which indicates crashes may be occurring more often than what can be attributed to random occurrence

The following data was used for the CRF calculations:

*Crash data: January 1, 2010 through December 31, 2015, 6 years

*4-year crash rate (2011-2014)

*Most current, pre-STAA ban AADT; either 2013 or 2014 AADT

* the pre-STAA ban data was used to maintain consistency with the available crash records and most recent crash rates

Full corridor calculations used weighted averages for AADT and Functional Class Rate

HMVM: Hundred Million Vehicle Miles traveled

RC: Kentucky Transportation Center, *The Analysis of Traffic Crash Data in Kentucky (2010-2014)*

CCRF: Critical Crash Rate Factor

Appendix E

Pavement Condition Evaluation Reports

Explanation of Pavement Surface Conditions

Pavement Management in Kentucky

Department of Highways
Division of Operations
Pavement Condition Evaluation Form

Route:	Road Name:	Project Number	District	Date
KY0151	ALTON RD+GRAEFENBURG RD	FD05-003-0151-000-005	7	7/15/2014

From:	From:	County	# of Lanes	
0.000	US 127/US 127B	ANDERSON	2	2013 0-4.587 AC Overlay

To:	To:	State Aid	ADT	Speed
4.587	ANDERSON - FRANKLIN COUNTY LINE	SP	5633	55

Length:	Note: 2030
4.587	

Condition Survey

	Extent										Severity										Points
		Few			Intermediate				Extensive			Slight			Moderate				Severe		
Fatigue Cracking	0.0	0	1	2	3	4	5	6	7	8	9	0.0	0	1	2	3	4	5	6	7	8	9	0.0
Raveling	0.0	0		1		2		3		4	5	0.0	0		1		2		3		4	5	0.0
Other Cracking	0.0	0		1		2		3		4	5	0.0	0		1		2		3		4	5	0.0
Out of Section	0.0	0	0.5	1	1.5	2	2.5	3				0.0	0	0.5	1	1.5	2	2.5	3				0.0

Raters Collins Seasonal

( ) Clark ( ) Collins
( ) Garner ( ) Hill
( ) Lambert ( ) Mason
( ) Myatt ( ) Nowaczyk

Assessment Resurface Later

Improve ? ( ) This Year ( ) Next Year
( ) Later _____ ( ) Remove

How ? ( ) Resurface ( ) Inlay
( ) _____

Leveling and Wedging 20 % Recent Patching <5 %

☐ Mill _____

Appearance 0 0.5 1 1.5 2 2.5 3 — 0.0

Rideability (IRI) N/E 118 Adjustment 26 — Sub: 0.0

Rutting S/W 110 Adjusted IRI 92 — 12.0

<1/4"= 0
1/4" =3
5/16" =4.5
3/8" =6

7/16" = 7.5
1/2" = 9
9/16" = 10.5
5/8" = 12
>=3/4" = 15

N/E _____ — 0.0

S/W _____ Average _____

Roadway Features AC

AC PCC AC/PCC AC+AC/PCC

Curb & Gutter ☐ Manhole ☐ Inlet ☐

Shoulder - + ____ in. Width .5 ft ft.

Type AC
( ) AC ( ) Earth ( ) Gravel ( ) Concrete
( ) Chipseal ( ) _____

Haul ( ) Coal ( ) Logging ( ) Rock
( ) _____

Joint Separation	0.0
Grind	0.0
Total Points	12.0
Rank By Points	
Central Office Rank	
District Rank	

Notes: 2026

District Recommendation	Preparer	Cost Estimate $365,015.00

Treatment Codes

Preparation_____
Shoulders_____
Asphalt Surface _____
Surface, Base or Binder _____
Base or Binder _____

Remarks CO Estimate

Department of Highways
Division of Operations
Pavement Condition Evaluation Form

Route:	Road Name:	Project Number	District	Date
KY0151	KY HIGHWAY 151	FD05-037-0151-000-003	5	7/28/2014

From:	From:	County	# of Lanes	
0.000	ANDERSON - FRANKLIN COUNTY LINE	FRANKLIN	2	2014 0-3.224 AC Overlay

To:	To:	State Aid	ADT	Speed
2.411	.123 Before CRAB ORCHARD RD	SP	4873	55

Length:	Note:
2.411	update history water in joint 2012 overlay

Condition Survey

	Extent										Severity										Points
		Few			Intermediate				Extensive			Slight			Moderate				Severe		
Fatigue Cracking	0.0	0	1	2	3	4	5	6	7	8	9	0.0	0	1	2	3	4	5	6	7	8	9	0.0
Raveling	0.0	0		1		2		3		4	5	0.0	0		1		2		3		4	5	0.0
Other Cracking	0.0	0		1		2		3		4	5	0.0	0		1		2		3		4	5	0.0
Out of Section	2.5	0	0.5	1	1.5	2	2.5	3				1.0	0	0.5	1	1.5	2	2.5	3				3.5

Raters Nowaczyk Watson

( ) Clark ( ) Collins
( ) Garner ( ) Hill
( ) Lambert ( ) Mason
( ) Myatt ( ) Nowaczyk

Assessment Resurface Later

Improve ? ( ) This Year ( ) Next Year
( ) Later _____ ( ) Remove

How ? ( ) Resurface ( ) Inlay
( ) _____

Leveling and Wedging 20 % Recent Patching <5 %

☐ Mill _____

Appearance 0 0.5 1 1.5 2 2.5 3 — 0.0

Rideability (IRI) N/E 112 Adjustment 26 — Sub: 3.5

Rutting S/W 110 Adjusted IRI 86 — 10.0

<1/4"= 0
1/4" =3
5/16" =4.5
3/8" =6

7/16" = 7.5
1/2" = 9
9/16" = 10.5
5/8" = 12
>=3/4" = 15

N/E _____ — 0.0

S/W _____ Average _____

Roadway Features AC

AC PCC AC/PCC AC+AC/PCC

Curb & Gutter ☐ Manhole ☐ Inlet ☐

Shoulder - + ____ in. Width 4 ft.

Type AC
( ) AC ( ) Earth ( ) Gravel ( ) Concrete
( ) Chipseal ( ) _____

Haul ( ) Coal ( ) Logging ( ) Rock
( ) _____

Joint Separation	0.0
Grind	0.0
Total Points	13.5
Rank By Points	
Central Office Rank	
District Rank	

Notes: 2025

District Recommendation	Preparer	Cost Estimate

Treatment Codes

Preparation_____
Shoulders_____
Asphalt Surface _____
Surface, Base or Binder _____
Base or Binder _____

Remarks 2012 overlay

Explanation of Pavement Surface Conditions

Fatigue Cracking: Load related cracks predominately parallel to the pavement centerline are classified as fatigue cracking. Cracks associated with the beginning of alligator cracking are generally discontinuous, broken, and occur in the wheel path.

Raveling: Raveling is the wearing away of the pavement surface caused by dislodging of aggregate particles and loss of asphalt binder. Raveling ranges from loss of fines to loss of some coarse aggregate and ultimately to a very rough and pitted surface with obvious loss of aggregate.

Other Cracking: Other cracking includes age related, non-load cracking. These cracks can run roughly perpendicular to the roadway center line. Joint reflective cracking from overlaid rigid pavements within the lane should be evaluated as other cracking. Longitudinal cracks near the lane edges that are commonly associated with paving construction joints are also included.

Out of Section: Out of section is considered only for resurfacing program evaluations. Areas that are outside of the typical section are localized depressions or elevated areas of pavement that result from settlement, pavement shoving, or displacement.

Joint Separation: Longitudinal cracks near the lane edges that are commonly associated with paving construction joints.

Ride Quality: A primary objective for ride quality testing is to gather information about the pavement that is sufficient to estimate the satisfaction of the traveling public. The judgment of the public depends in a large part on the ride experienced.

The ride quality of Kentucky's pavements is measured by the International Roughness Index (IRI). The IRI is produced using a quarter-vehicle model and a measured longitudinal profile. Longitudinal profile measurements are made with laser profilers and on-board microprocessors that provide results at the time of testing and record data for later processing. IRI values for the left and right wheel paths are averaged to determine IRI values for the pavement.

Rutting:
KYTC uses a Laser Crack Measurement System which measures a 4000 point transverse rutting profile every 2 feet longitudinally. Rutting on Interstate and Parkway is now measured annually. Rutting on other pavements is measured on a two to three year cycle.

PAVEMENT MANAGEMENT IN KENTUCKY

An Overview in Year 2014

Operations and Pavement Management Branch
Division of Maintenance
Department of Highways
Kentucky Transportation Cabinet

November, 2014
Revised from September, 2001

PAVEMENT MANAGEMENT IN KENTUCKY

ORGANIZATION OF THE OPERATIONS & PAVEMENT MANAGEMENT BRANCH

The responsibility for determining pavement needs on a statewide basis was originally assigned to the Pavement Branch within the Division of Maintenance in 1981. Shortly thereafter, the unit was moved to the State Highway Engineer's Office under the Assistant State Highway Engineer for Operations. In 1987, the unit was moved to the Division of Specialized Programs, which was composed of several staff functions. Then, in 1994 the unit became a branch of the Division of Operations (which later became the Division of Maintenance).

In 2001, the duties of the branch were expanded to include management of the KYTC Maintenance Rating Program and Operations Management Systems. The unit was subsequently renamed the Operations & Pavement Management Branch. Currently, the branch is staffed with five engineers, five technicians and an engineering assistant. Policies and procedures applicable to the Operations & Pavement Management Branch are included in the Maintenance Guidance Manual.

PURPOSE

To develop and maintain an ongoing list of pavement needs based on independent, objective evaluations of conditions and detailed pavement distress data; to collect and analyze data to assess maintenance performance across the state; and to provide support for asset management.

GOALS AND FUNCTIONS

The concept of service to the highway user has guided development of the pavement management program by focusing efforts on functions that have a clear impact on the highway users. Important pavement management functions are as follows:

- Measure ride quality of all pavements to assess general conditions and estimate current and anticipated improvement needs.
- Perform visual assessments of pavements in order to select and prioritize those in need of rehabilitation or restoration.
- Assess impacts and recommend changes in programs, practices, policies and specifications affecting condition and performance of pavements.
- Maintain pavement database information for effective communication and coordination of pavement related activities within the Department of Highways.
- Provide data, information, and results of analyses to other KYTC units and outside agencies whenever necessary.

GUIDING PRINCIPLES

In performing the functions of pavement management, it will occasionally be necessary to modify existing procedures to account for changing needs, conditions, personnel, and resources. When making such changes, the following principles should be adhered to:

- Condition of pavements is to be measured in the most objective manner possible with available technology and personnel.
- Pavement needs will be determined not only based on condition, but also traffic considerations. These considerations should be applied in a consistent manner across the state.
- Rather than allowing pavements to deteriorate until more expensive treatments are required, emphasis should be placed on maintaining pavements in good condition through preventive maintenance techniques.
- District recommendations should be considered when prioritizing individual projects – particularly regarding routes that are local in nature. Conversely, greater consideration should be given to central office recommendations for routes having regional, statewide, or national impact.
- Where applicable, standards for conducting tests and condition assessments should be adhered to and thoroughly documented.

MAJOR TASKS

Visual Evaluation of Pavements on MP System

Previously, each district was required to submit a list of MP road sections identified for resurfacing and a list of State Primary sections that required rehabilitation (any treatment beyond a typical resurfacing project). Operations & Pavement Management staff would then conduct visual evaluations of these sections in order to prioritize needs within each district and to determine appropriate treatments.

In 2007, KYTC began a preventive maintenance program in order to achieve a higher level of performance by focusing a portion of maintenance funds on low-cost treatments that extend the life of pavements. These treatments must be applied to pavements that are not yet significantly distressed. In order to identify potential candidates for such treatments, it is necessary to evaluate sections that are still relatively new. Since pavements submitted for resurfacing are generally not good candidates for preventive maintenance, it was necessary to make changes to the evaluation process.

Beginning with the 2007 evaluations, sections were still chosen from district submissions based on resurfacing needs. However, additional mileage was selected by Operations & Pavement Management staff to ensure that at least 1/3 of the entire MP system was evaluated. These additional sections had a wide range of pavement ages, thereby increasing the likelihood that viable preventive maintenance candidates could be identified. Furthermore, this process provides a method to isolate significantly deteriorated pavements that might not otherwise have been identified through the previous method.

Beginning with the 2009 evaluations, districts are provided a list of roads to be evaluated in the upcoming season. This list comprises approximately one-third of the entire MP system as well as 1/2 of all completed preventive maintenance treatments in each district.

Additionally, condition assessments for those pavements evaluated in each of the previous two years are provided along with estimated current condition scores. Estimates of current conditions will be based on models developed with data from the Pavement Management System. If district personnel feel that the estimated condition assessments for any previously evaluated sections is inaccurate, those sections can be added to the current year evaluation list upon request by the district.

MP routes with less than 375 ADT are excluded from this process and are to be prioritized for low volume road funding at the districts' discretion.

FD05 Resurfacing Program

Once the visual evaluations are completed, all MP sections are ranked according to year of recommended treatment and total condition points. This ranking includes sections evaluated in previous years. District personnel will then have the right to add up to five points to the total condition points of any sections they choose based on their own assessment of needs.

District personnel will then provide windshield cost estimates for all projects recommended for resurfacing in the current or upcoming year. These estimates will be used in the FD05 Budget Allocation Program in order to determine each district's FD05 allotment. The districts will also prepare detailed estimates for projects anticipated to actually be completed with available funds.FD04 Preventive Maintenance Program

FD04 Preventive Maintenance Program

Once the visual evaluations are completed, MP sections that meet the distress point criteria for preventive maintenance treatments are submitted to the Preventive Maintenance Alliance (PMA) for further review. Those projects are then ranked by the Preventive Maintenance Alliance according to condition points and a cost benefit analysis that includes district distribution and asphalt prices. This ranking includes sections evaluated in previous years. The Operations and Pavement Management Branch will approve final project selection.

District personnel will then provide detailed estimates for all projects anticipated to be completed with available funds.

Interstates and Parkway Evaluations

Each year, the Operations & Pavement Management Branch performs pavement condition evaluations and ride quality measurements on the entire interstate and parkway systems; and recommends pavement rehabilitation treatments and priority rankings. Results are published each year in "Condition of Pavements on Kentucky Highways – Interstate and Parkway Roads".

As with the MP system, preventive maintenance treatments are now being emphasized on the Interstate and Parkway system. However, since annual assessments were already being performed, no changes to the evaluation process were necessary in order to identify candidate projects.

Rideability of Other Roads

All state-maintained road sections greater than 0.25 miles in length are tested for ride quality by Operations & Pavement Management on a two year cycle. Conditions are reported annually in "Condition of Pavements on Kentucky Highways – MP and RS Roads".

If staffing or equipment limitations do not allow for coverage of all roads, Interstate routes will be given top priority, followed by Parkway, State Primary, State Secondary, Supplemental, and Rural Secondary routes.

Ride Quality Requirements

New construction and other contract maintenance projects with ride quality specifications are tested by Operations & Pavement Management staff upon request by the resident engineer for the project. Results are reported to the Division of Construction so that bonus pay, penalties, or corrective work can be applied.

Six-Year Plan

In odd numbered years, the Division of Maintenance works with the Division of Highway Design to prepare lists of recommended pavement rehabilitation for Interstate, Parkway and State Primary roads to be included in the next six-year plan. The list is priority ranked and includes recommended treatment, cost estimate, and recommended year for the work to be done. Once the plan has been approved, the list is updated and distributed.

Highway Performance Monitoring Study (HPMS)

In even-numbered years, Operations & Pavement Management staff collects ride quality test data for the Division of Planning for submission to the Federal Highway Administration as a part of the KYTC reporting to Congress on the condition and performance of the nation's highway system.

Photolog Image Collection

As part of the Cabinet's efforts to move toward a more comprehensive asset management program, photolog images of the road and right of way are being collected in conjunction with rideability data. Current staffing and equipment availability will allow this data to be collected on a two year cycle. Certain low-volume roads may be excluded from this process due to the physical constraints of the data collection vehicle.

GOALS FOR MAJOR TASKS

Visual Evaluation of Pavements on MP System

Send information regarding previous year condition evaluations and planned evaluation list to districts by March 15 each year. Districts should respond with list of additional resurfacing evaluation requests by April 15 and preventive maintenance considerations by April 30.

Evaluations should begin in May of each year, and will be completed so that data is available to the districts by September 1. Districts should prepare windshield cost estimates of all projects recommended for resurfacing in the current or upcoming year. These estimates should be returned to the Operations & Pavement Management Branch by October 31. Projects recommended for preventive maintenance should be returned by November 15.

Detailed estimates for projects expected to be completed in upcoming year will be due from districts in one-third increments each month beginning October 15th. All detailed estimates for upcoming projects must be submitted to Roadway Preservation Branch by December 15th.

At least 99% of all MP pavement sections greater than 0.25 miles in length and 375 ADT will be evaluated at least once every three years. Exceptions will be made for pavements under construction or that are inaccessible due to unforseen circumstances (rock slide, flooding, etc).

Interstates and Parkway Evaluations

Ride quality testing will be completed by September 30.

Pavement condition evaluations will be completed by April 30.

Condition of Pavements data will be prepared and made available by January 31.

At least 98% of all Interstate and Parkway lane miles will be tested annually. Exceptions will be made for pavements under construction or that are inaccessible due to unforseen circumstances (rock slide, flooding, etc).

Rideability of Other Roads

At least 98% of National Highway System roadway miles will be tested for ride quality by December 1 of each year. Other roadway miles will be tested for ride quality on a two year cycle with at least 45% complete by December 1 of each year. Exceptions will be made for pavements under construction or that are inaccessible due to unforseen circumstances (rock slide, flooding, etc).

All pavement sections will be updated for milepoint termini, system change, resurfacing date, and traffic volumes by February 15.

Condition of Pavements report will be prepared and distributed by May 15.

Ride Quality Requirements

Each project will be tested and reported within two weeks of receiving the request for testing. A good-faith effort will be made to accommodate the schedule of contractors when projects must be opened to traffic.

Six-Year Plan

Tabulation of recommended pavement rehabilitation work will be completed by June 30 of odd numbered years. Tabulation of pavements approved for rehabilitation will be completed and distributed by June 30 of even numbered years.

Highway Performance Monitoring Study (HPMS)

Sections will be tested and data made available by April 15 of odd numbered years.

Photolog Image Collection

An initial inventory of images for the majority of state maintained roads was completed in 2013. Moving forward, the goals are to collect the National Highway System annually and all other state maintained roads on a two year cycle.

TEST METHODS AND PROCEDURES

RIDE QUALITY

The purpose of a pavement is to provide a surface for vehicles to run over at appropriate speeds. A primary objective for ride quality testing is to gather information about the pavement that is sufficient to estimate the satisfaction of the traveling public. The judgment of the public depends in a large part on the ride experienced.

Beginning in the 1960's, the ride quality of Kentucky's pavements was reported in terms of Rideability Index (RI), which ranges from zero to five. In 2003, RI was replaced with the more commonly used International Roughness Index (IRI) (ASTM E-1926).

The IRI is produced using a quarter-vehicle model and a measured longitudinal profile. Longitudinal profile measurements are made with laser profilers (ASTM E950) and on-board microprocessors that provide results at the time of testing and record data for later processing. The quarter-car model is complete with the basic parameters necessary to describe an automobile. IRI values for the left and right wheelpaths are averaged to determine IRI values for the pavement.

Currently the branch has three vehicles capable of capturing the longitudinal profile, rutting, faulting, and photolog images of the road and right of way.

RUTTING

Previously, ruts on Interstates and Parkways were measured annually using a 5-point laser profiler. Equipment problems eliminated this source of data beginning in 2004. Beginning in 2009, continuing through 2013, the Cabinet began measuring rutting using a 1200 point transverse profile. Starting in 2013, the Cabinet moved to a Laser Crack Measurement System which measures a 4000 point transverse rutting profile every 2 feet longitudinally. Rutting on Interstate and Parkway is now measured annually. Rutting on other pavements is measured on a two to three year cycle.

CONDITION EVALUATION - FLEXIBLE PAVEMENTS

Fatigue Cracking

Description

Load related cracks predominately parallel to the pavement centerline are classified as fatigue cracking. Cracks associated with the beginning of alligator cracking are generally discontinuous, broken, and occur in the wheel path.

Note

Sealed cracks where the sealant remains in good condition should be rated as slight severity cracking. If the sealant is showing distress the original crack severity should be rated.

Extent

Few **0-3 Points**
Less than 20% of potential cracking areas show distress
Use a maximum of four potential cracking areas per section

Intermediate **4-6 Points**
20% - 50% of potential cracking areas show distress
Use a maximum of four potential cracking areas per section

Extensive **7-9 Points**
Greater than 50% of potential cracking areas show distress
Use a maximum of four potential cracking areas per section
Max allowable percentage of potential cracking areas that show distress is 75%

Severity

Slight **0-3 Points**
Cracks are less than ¼" in width
No adjacent hairline cracking

Moderate **4-6 Points**
Cracks are about ¼" in width
May have light spalling
Random adjacent cracking
Early stages of alligator cracking may be forming

Severe **7-9 Points**
Cracks are greater than 3/8" in width
Edges are severely spalled
Significant adjacent cracking progressed into alligator cracking
Potholes are possible

Raveling

Description

Raveling is the wearing away of the pavement surface caused by dislodging of aggregate particles and loss of asphalt binder. Raveling ranges from loss of fines to loss of some coarse aggregate and ultimately to a very rough and pitted surface with obvious loss of aggregate.

Extent

Few **0-1 Points**
½ or more of the section shows slight raveling –or-
1/3 or more of the section has a combination of slight and moderate raveling
No severe raveling is present

Intermediate **2-3 Points**
½ or more of the section shows moderate distress –or-
1/3 or more of the section has a combination including severe raveling

Extensive **4-5 Points**
1/3 or more of the section shows severe raveling

Severity

Slight **0-1 Points**
Slight loss of aggregate or binder
Small amounts of pitting
Pavement appears slightly aged or rough

Moderate **2-3 Points**
Fine aggregate partially missing
Pitting is evident
Pavement appears moderately rough and loose particles may be present

Severe **4-5 Points**
Aggregate and binder have worn away significantly
Pavement appears deeply pitted and very rough

Other Cracking

Description

Other cracking includes age related, non-load cracking. These cracks can run roughly perpendicular to the roadway center line. Joint reflective cracking from overlaid rigid pavements within the lane should be evaluated as other cracking. Longitudinal cracks near the lane edges that are commonly associated with paving construction joints are also included.

Note

Sealed cracks where the sealant remains in good condition should be rated as slight severity cracking. If the sealant is showing distress the original crack severity should be rated.

Extent

Few **0-1 Points**
Transverse cracks are spaced at 150'
Less than 20% of the section length shows longitudinal cracking

Intermediate **2-3 Points**
Transverse cracks are spaced at 50'
20% - 50% of the section length shows longitudinal cracking

Extensive **4-5 Points**
Transverse cracks are spaced closer than 50' but not less than 25'
Greater than 50% of the section length shows longitudinal cracking
Max allowable percentage of section length with longitudinal cracking is 75%

Note

If both transverse and longitudinal cracks are present add extent points.

Severity

Slight **0-1 Points**
Cracks are less than ¼" in width

Moderate **2-3 Points**
Cracks are ¼" to ½" wide
There may be slight secondary cracking
Edges may be spalled

Severe **4-5 Points**
Cracks are greater than ½"
Significant secondary cracking is present
Edges are severely spalled

Out of Section

Note

Out of section is considered only for resurfacing program evaluations.

Description

Areas that are outside of the typical section are localized depressions or elevated areas of pavement that result from settlement, pavement shoving, or displacement.

Extent

Few **0-1 Points**
Less than two localized sections per mile

Intermediate **1.5-2 Points**
Two to four localized sections per mile

Extensive **2.5-3 Points**
More than four localized sections per mile

Severity

Slight **0-1 Points**
Noticeable effect on ride

Moderate **1.5-2 Points**
Some discomfort

Severe **2.5-3 Points**
Poor ride
Safety is a concern at maintained speed limit

Patching

Note
Patching is considered only for interstate and parkway evaluations.

Description
Patches are portions of the pavement surface that has been removed and replaced or additional material applied to the pavement after original construction.

Extent

Few **0-1 Points**
Less than 4 pothole patches and/or cutouts per mile
Machine patching is present on less than 5% of the section area

Intermediate **1.5-2 Points**
4-7 pothole patches and/or cutouts per mile
Machine patching is present on 5% - 15% of the section area

Extensive **2.5-3 Points**
8-10 pothole patches and/ore cutouts per mile
Machine patching is present on more than 15% of the section area
Max allowable percentage of section area with machine patching is 25%

Note
If both pothole patching/cutouts and machine patching are present add extent points.

Severity

Slight **0-1 Points**
Patch has nearly straight edges, rough texture, and surface contours which mimic the surface around the patch

Moderate **1.5-2 Points**
Patch has edges shaped to contours of surrounding pavement and is of variable thickness with feathered edges

Severe **2.5-3 Points**
Patch has loss of material and is settled

Patching

Note
Patching is considered only for interstate and parkway evaluations.

Description
Patches are portions of the pavement surface that has been removed and replaced or additional material applied to the pavement after original construction.

Extent

Few **0-1 Points**
Less than 4 pothole patches and/or cutouts per mile
Machine patching is present on less than 5% of the section area

Intermediate **1.5-2 Points**
4-7 pothole patches and/or cutouts per mile
Machine patching is present on 5% - 15% of the section area

Extensive **2.5-3 Points**
8-10 pothole patches and/ore cutouts per mile
Machine patching is present on more than 15% of the section area
Max allowable percentage of section area with machine patching is 25%

Note
If both pothole patching/cutouts and machine patching are present add extent points.

Severity

Slight **0-1 Points**
Patch has nearly straight edges, rough texture, and surface contours which mimic the surface around the patch

Moderate **1.5-2 Points**
Patch has edges shaped to contours of surrounding pavement and is of variable thickness with feathered edges

Severe **2.5-3 Points**
Patch has loss of material and is settled

Joint Separation

Description

Longitudinal cracks near the lane edges that are commonly associated with paving construction joints.

Note

Sealed cracks where the sealant remains in good condition should be rated as slight severity cracking. If the sealant is showing distress, the original crack severity should be rated.

Extent

Few **0 Points**
Less than 20% of the section length shows longitudinal cracking.

Intermediate - Extensive **Rate Severity**
Greater than 20% of the section length shows longitudinal cracking.

Severity

Slight **0-1 Points**
Cracks are less than ¼" in width.

Moderate **2-3 Points**
Cracks are ¼" to ½" wide.
There may be slight secondary cracking.
Edges may be spalled.

Severe **4-5 Points**
Cracks are greater than ½".
¾" is the max allowable crack width.
Significant secondary cracking is present.
Edges are severely spalled.

CONDITION EVALUATION - CONCRETE PAVEMENTS

Joint Deterioration

Definition

Joint deterioration refers to spalling that occurs when fragments break off along the edges of the pavement joints or cracks. Joints that have bituminous patches are also considered as spall.

Extent

Few **0-3 Points**
Less than 20% of panels

Intermediate **4-6 Points**
20% - 40% of panels

Extensive **7-9 Points**
Greater than 40% of panels
75% of panels is maximum allowable

Severity

Slight **0-3 Points**
Spalling occurs a minimum of 2" from the edge of the joint for a continuous length of less than 1'along the joint
Joint sealant is in good condition
Joints that have bituminous patches for less than 1'
D cracking and/or corner breaks are tight with no loose pieces

Moderate **4-6 Points**
Spalling occurs a minimum of 2" from the edge of the joint for a continuous length of 1' – 3' along the joint
Joint sealant is beginning to come apart
Joints that have bituminous patches for 1' – 3'
D cracking and/or corner breaks are well defined with small loose pieces

Severe **7-9 Points**
Spalling occurs a minimum of 3" from the edge of the joint for a continuous length of greater than 3' along the joint
Joint sealant is in poor condition
Joints that have more than 3' of bituminous patching
D cracking and/or corner breaks have developed into a pattern with significant amounts of loose material

Faulting

Description

Faulting is a difference in elevation across a joint or crack. Generally, faulting is found as a "step" across a transverse joint in the direction of travel.

Extent

Few **0-1 Points**
Less than 20% of panels

Intermediate **2-3 Points**
20% - 40% of panels

Extensive **4-5 Points**
Greater than 40% of panels
75% of panels is maximum allowable

Severity

Slight **0-1 Points**
Less than ¼" settlement at joints

Moderate **2-3 Points**
¼" to ½" settlement at joints

Severe **4-5 Points**
Greater than ½" settlement at joints
¾" is the max allowable settlement at joints

Other Cracking

Description
Other cracking includes breaks that may form transversely or longitudinally within the panel.

Extent

Few **0-1 Points**
Less than 20% of panels

Intermediate **2-3 Points**
20% - 40% of panels

Extensive **4-5 Points**
Greater than 40% of panels
75% of panels is maximum allowable

Severity

Slight **0-1 Points**
1 crack per panel

Moderate **2-3 Points**
2 to 3 cracks per panel

Severe **4-5 Points**
4 or more cracks per panel

Patching

Description

Patches are portions of the pavement surface that has been removed and replaced or additional material applied to the pavement after original construction.

Note

Do not include bituminous patching of joints in the patching evaluation.

Extent

Few	**0-1 Points**
Intermediate	**1.5-2 Points**
Extensive	**2.5-3 Points**

Severity

Slight **0-1 Points**

Patch has nearly straight edges, rough texture, and surface contours which mimic the surface around the patch

Moderate **1.5-2 Points**

Patch has edges shaped to contours of surrounding pavement and is of variable thickness with feathered edges

Severe **2.5-3 Points**

Patch has loss of material and is settled

DEMERIT POINTS FOR IRI AND ADJUSTMENTS FOR TRAFFIC VOLUMES

Ride quality values (IRI) are adjusted for traffic volume levels (vehicles per day) as detailed in **Table 1**. IRI demerit points vary from 0 to 38 and are assigned based on the Adjusted IRI (**Table 2**) where:

Adjusted IRI = IRI (measured) – IRI Adjustment (from Table 1)

Traffic Volume (ADT) Range		IRI Adjustment
2 – lane	4 – lane	
> 12,000	> 16,100	0
10,001 – 12,000	12,651 – 16,100	6
8,001 – 10,000	9,601 – 12,650	13
6,001 – 8,000	6,901 – 9,600	19
4,001 – 6,000	4,401 – 4,900	26
2,001 – 4,000	2,151 – 4,400	32
1,501 – 2,000	1,601 – 2,150	38
1,001 – 1,500	1,051 – 1,600	45
801 – 1,000	826 – 1,050	51
601 – 800	611 – 825	58
401 – 600	401 – 610	64
201 – 400	201 – 400	70
<200	<200	77

TABLE 2. DEMERIT POINTS FOR ADJUSTED IRI

Adjusted IRI	Demerit Pts	Adjusted IRI	Demerit Pts	Adjusted IRI	Demerit Pts
≤ 53	0	94 – 96	13	135 – 138	26
54 – 57	1	97 – 99	14	139 - 141	27
58 – 61	2	100 – 102	15	142 – 144	28
62 – 64	3	103 – 106	16	145 – 148	29
65 – 67	4	107 – 109	17	149 – 151	30
68 – 70	5	110 – 112	18	152 – 154	31
71 – 74	6	113 – 115	19	155 – 157	32
75 – 77	7	116 – 118	20	158 – 160	33
78 – 80	8	119 – 122	21	161 – 163	34
81 – 83	9	123 – 125	22	164 – 167	35
84 – 86	10	126 – 128	23	168 – 170	36
87 – 90	11	129 – 131	24	171- 173	37
91 – 93	12	132 – 134	25	> 174	38

SKID RESISTANCE

District Traffic personnel will serve as the primary contact for requests involving pavement slickness. In order to minimize the number of unnecessary skid tests, the initial investigation should rule out other potential contributing factors to wet pavement crashes such as rutting, ponding of water, high shoulders, and other drainage issues. District Project Delivery & Preservation personnel should be contacted to assist in evaluating these concerns. Other contributing factors may include poor visibility, signing, geometry, etc. If skid resistance is considered the likely problem upon completion of the initial investigation, testing should be requested.

The Chief District Engineer for the District will submit a request for skid testing directly to the Division of Materials. A copy of this request (along with supporting documentation) should be sent to Central Office Traffic Operations. Skid resistance measurements are made by the Division of Materials using a pavement friction tester in accordance with ASTM E-274. The measurement is expressed as skid number (SN), and the scale ranges from 0 to 100. Tests are made in the left wheel path of each lane at 0.5 mile intervals. Test results will be forwarded to the Divisions of Traffic Operations, Maintenance, and the District Traffic Branch Manager.

The following actions will be necessary based on the results of the skid test:

Skid Number	Action
39 or Greater	No further action is necessary
27 to 38	Section will be incorporated into the resurfacing program evaluation process with demerit points assigned for friction. These pavements should continue to be tested on a regular schedule until treatment is applied. Slippery When Wet signage would be recommended for pavements in this range.
26 or Below	Improvement should be given a high priority. Alternative treatments and funding sources should be considered if the pavement is not a good candidate for resurfacing. Slippery When Wet signage would be recommended for pavements in this range.

The Operations and Pavement Management Branch does not administer Skid Resistance testing or remediation efforts. When tests are performed as outlined above and provided to the Division of Maintenance, skid numbers will be used in conjunction with visual assessments to assign demerit points as outlined in **Table 3.**

TABLE 3. DEMERIT POINTS FOR SKID NUMBER	
SN	**Demerit Pts**
38	1
37	2
36	3
35	4
34	5
33	6
32	7
31	8
30	9
29	10
28	11
27 or less	12

PAVEMENT CONDITION ASSESSMENT FOR GASB-34 REPORTING

Pavements shall be assessed on an annual basis for the purposes of reporting the state's condition of assets. No more than 30% of pavements shall be in poor condition. Determining pavement condition is a two-step process.

First, recommended treatment years are defined through the visual assessment processes previously described. Pavements that have been determined to be in need of resurfacing (for asphalt pavements) or diamond grinding (for concrete pavements) within one year shall be rated in poor condition. Pavements determined to need such treatment within 2-4 years shall be rated in fair condition. All other pavements shall be rated in good condition.

The second step of the condition analysis requires that each pavement be rated according to traffic volume and roughness as defined in **Table 4**. This step may result in a decline of assessed condition for pavements previously rated in step 1. However, this step cannot result in a condition assessment that is better than what was defined based on visual assessments. Where visual assessments are not available, condition will be determined solely by evaluation of the most recent IRI and traffic volume data.

TABLE 4. CONDITION ASSESSMENTS BASED ON IRI AND TRAFFIC VOLUME

ADT	POOR CONDITION	FAIR CONDITION	GOOD CONDITION
Above 12000	130 or higher	98 – 129	97 or lower
10001-12000	136 or higher	102 – 135	103 or lower
8001-10000	143 or higher	111 – 142	110 or lower
6001-8000	149 or higher	117 – 148	116 or lower
4001-6000	155 or higher	124 – 154	123 or lower
2001-4000	162 or higher	130 – 161	129 or lower
1501-2000	168 or higher	136 – 167	135 or lower
1001-1500	175 or higher	143 – 174	142 or lower
801-1000	181 or higher	149 – 180	148 or lower
601-800	188 or higher	156 – 187	155 or lower
401-600	194 or higher	162 – 193	161 or lower
201-400	200 or higher	168 – 199	167 or lower
1-200	207 or higher	175 – 206	174 or lower

YEARLY DECREASE IN RIDE QUALITY

For Interstate and Parkway pavements, condition (demerit) points are given for increases in IRI value from the previous year according to the following equation:

Points = IRI Increase / 6.4

ANNUAL DETERIORATION OF MP PAVEMENTS

MP pavements evaluated in previous years will receive additional deterioration points based on the year of last evaluation. As more data becomes available, annual deterioration points may be refined based on district, traffic volume, pavement design or other factors.

Deterioration Points = 2 * (Current Year – Year of Last Evaluation)

RUTTING

Condition (demerit) points for ruts vary from 0 to 15 as follows:

Ruts	**Demerit Points**
<1/4”	0
1/4”	3
3/8”	6
1/2”	9
5/8”	12
3/4” or more	15

PAVEMENT MANAGEMENT FUNDING SOURCES

Pavement Management Treatments can be broadly grouped into the three major categories below:

- **Rehabilitation/Reconstruction** treatments consist of those which address underlying structural deficiencies in pavements that are significantly deteriorated.

- **Preservation** treatments prolong the life of pavements by reducing their rate of deterioration but do not add structural capacity.

- **Reactive Maintenance** treatments are meant to restore serviceability in instances of sudden or catastrophic defects, but do not prolong pavement life or add structural capacity.

An effective pavement management program must ensure a balance between these three major categories of treatments. Sufficient funding is not available to focus solely on the rehabilitation or reconstruction of pavements in poor condition; nor is it acceptable to simply perform reactive maintenance while never addressing structural issues. Consequently, separate sources of funding must be maintained which ensure an equitable distribution of treatments across these categories. Table X illustrates the state funding sources available for various pavement management treatment types.

Funding Source	Description	Treatment Categories
FE01	Roadway Maintenance	Reactive Maintenance and Preservation
FD05	Statewide Resurfacing	Preservation (limited to MP pavements)
FD04	State Fund Projects (SP)	Rehabilitation/Reconstruction/ Preventive Maintenance
FD39	Contingency Projects	Any (per approval by Secretary of Transportation)
FD52	Federal Funding State Match	Any (limited to Federal Aid System)
CB06	Rural Secondary Construction	Any (limited to Rural Secondary roads)

It is imperative that funding sources be reserved for the appropriate treatment categories. Use of preservation funding for major rehabilitation or reconstruction projects is unacceptable and will ultimately lead to a larger percentage of pavements in poor condition.

PAVEMENT MANAGEMENT TREATMENT DEFINITIONS

Within the broad categories of treatments there are more narrowly defined classes of treatment types. Following is a list of treatment types as defined by the Federal Highway Administration (FHWA). *Source:* http://www.fhwa.dot.gov/pavement/preservation/091205.cfm

REHABILITATION/RECONSTRUCTION

Major rehabilitation "consists of structural enhancements that both extend the service life of an existing pavement and/or improve its load-carrying capability."

Pavement Reconstruction is the replacement of the entire existing pavement structure by the placement of the equivalent or increased pavement structure. Reconstruction usually requires the complete removal and replacement of the existing pavement structure. Reconstruction may utilize either new or recycled materials incorporated into the materials used for the reconstruction of the complete pavement section. Reconstruction is required when a pavement has either failed or has become functionally obsolete.

PRESERVATION

Minor rehabilitation consists of non-structural enhancements made to the existing pavement sections to eliminate age-related, top-down surface cracking that develop in flexible pavements due to environmental exposure. Because of the non-structural nature of minor rehabilitation techniques, these types of rehabilitation techniques are placed in the category of pavement preservation.

Preventive Maintenance is "a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity)."

Preventive maintenance is typically applied to pavements in good condition having significant remaining service life. As a major component of pavement preservation, preventive maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface or near-surface of structurally sound pavements. Examples of preventive treatments include asphalt crack sealing, chip sealing, slurry or micro-surfacing, thin and ultra-thin hot-mix asphalt overlay, concrete joint sealing, diamond grinding, dowel-bar retrofit, and isolated, partial and/or full-depth concrete repairs to restore functionality of the slab; e.g., edge spalls, or corner breaks.

Routine Maintenance "consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions and events that restore the highway system to an adequate level of service."

Routine maintenance consists of day-to-day activities that are scheduled by maintenance personnel to maintain and preserve the condition of the highway system at a satisfactory level of service. Examples of pavement-related routine maintenance activities include cleaning of roadside ditches and structures, maintenance of pavement markings and crack filling, pothole patching and isolated overlays. Crack filling is another routine maintenance activity which consists of placing a generally, bituminous material into "non-working" cracks to substantially reduce water infiltration and reinforce adjacent top-down cracks. Depending on the timing of application, the nature of the distress, and the type of activity, certain routine maintenance activities may be classified as preservation. Routine Maintenance activities are often "in-house" or agency-performed and are not normally eligible for Federal-aid funding.

REACTIVE MAINTENANCE

Corrective Maintenance activities are performed in response to the development of a deficiency or deficiencies that negatively impact the safe, efficient operations of the facility and future integrity of the pavement section. Corrective maintenance activities are generally reactive, not proactive, and performed to restore a pavement to an acceptable level of service due to unforeseen conditions. Activities such as pothole repair, patching of localized pavement deterioration, e.g. edge failures and/or grade separations along the shoulders, are considered examples of corrective maintenance of flexible pavements. Examples for rigid pavements might consist of joint replacement or full width and depth slab replacement at isolated locations.

Catastrophic Maintenance describes work activities generally necessary to return a roadway facility back to a minimum level of service while a permanent restoration is being designed and scheduled. Examples of situations requiring catastrophic pavement maintenance activities include concrete pavement blow-ups, road washouts, avalanches, or rockslides.

STATEWIDE RESURFACING PROGRAM

OVERVIEW

The FD05 Statewide Resurfacing Program is administered through the Operations & Pavement Management Branch within the Division of Maintenance. Pavements are evaluated on a three-year cycle as outlined previously under "Major Tasks – Visual Evaluation of Pavements on MP System". The year of recommended resurfacing is defined during the evaluation and is based on the engineer's assessment of overall condition, rate of deterioration, and traffic loads.

Pavements are grouped according to their recommended year of resurfacing and are ranked according to overall condition. District personnel are consulted regarding possible adjustments to the recommended treatment year based on anticipated conflicts with construction, utility, or other projects. Also, district personnel may add up to five distress points to any pavement section in order to adjust its ranking on the list.

PROJECT VIABILITY

When evaluating pavement sections, engineers must determine if resurfacing is a viable treatment option based on pavement condition. Current practice for resurfacing AC pavements involves leveling and wedging and the application of a 1" or 1.25" bituminous surface course. A 1.5" surface course may be used where aggregate availability dictates or conditions warrant. Structurally adequate pavements rutted to a depth of 3/8" or more may be milled to minimize leveling and wedging requirements and to improve ride quality. Minimal repairs of base failures may also be allowed as part of a resurfacing project. However, structural improvements to pavements cannot be addressed through the FD05 resurfacing program. Such pavement distresses must be addressed with separate funding through a rehabilitation project.

In addition to milling, leveling and wedging, and surface course, other bid items may be required. These may include(but are not limited to) striping, raised pavement markers, accessible sidewalk ramps, traffic loops, thermoplastic markings, etc. Questions regarding specific items eligible for FD05 funding should be directed to the Central Office Division of Maintenance Roadway Preservation Branch.

FD05 BUDGET ALLOTMENT PROGRAM

Funding for FD05 projects is allocated to the highway districts on the basis of lane-miles of roads, cost of bituminous surface course materials, conditions of pavements, and estimated project costs within each district. The method for allocating funds has been in use since 1982 and was established in part to assure a competitive paving industry in all highway districts while also assuring that excessive allocations do not overburden the industry in any district.

Complete equalization in pavement conditions statewide is not sought because traffic loading, subgrade conditions, climate, terrain, etc. distinguishes one district from another and significantly affects pavement performance. The intent is to achieve more equal conditions over time without unduly straining the state's resources.

PREVENTIVE MAINTENANCE PROGRAM

OVERVIEW

Currently the Six Year Plan allows funding for preventive maintenance that is renewed on a year to year basis. Projects are evaluated through the normal process of visual assessment and in conjunction with input from district personnel. Additionally, districts are encouraged to identify preventive maintenance projects using Rural Secondary funding or district FE01 funding.

Following is a list of typical preventive maintenance treatments which may be considered, along with guidelines as to when each treatment would be most effective given current pavement conditions. These guidelines should provide a general framework from which engineers may make a decision as to the feasibility of a given treatment. However, circumstances may dictate that a specific treatment be included or excluded due to considerations not identified in these guidelines. Also, this list is not to be considered all-inclusive as other treatments may become available in the future which are not currently identified here.

Preventive Maintenance Alliance (PMA)

The Preventive Maintenance Alliance consists of maintenance personnel from the districts as well as from central office. The district is represented with one person from each branch of the twelve districts across the state. The central office is represented by the Operations and Pavement Management branch and a team member from each of the Divisions of Construction and Materials.

This alliance submits possible projects and verifies projects recommended by central office. The group meets annually to discuss project applications, performance, specifications, project and contractor reviews, and new products.

Routed Asphalt Crack Sealing

Crack sealing is the placement of a mixture of neat or modified binder mixed with polyester into existing cracks in the pavement.

Crack sealing prevents water and incompressibles from entering the pavement structure which slows the deterioration of moisture related distresses such as stripping, pumping of fines, and increased fatigue cracking.

Asphalt crack sealing is generally targeted to poor longitudinal construction joints or working cracks more than 1/8" but less than ½". Working cracks are defined as those that experience significant horizontal movements. Typical working cracks include: transverse thermal cracks, transverse reflective cracks, diagonal cracks, and working longitudinal cracks. Visible surface distresses should be fairly straight open longitudinal and transverse cracks with slight secondary cracking and slight raveling. Crack sealing is suitable for all traffic levels.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 5
Other Cracking	Extent and Severity both <=3
Joint Separation	Less than or equal to 3
Rutting	Less than or equal to 3/8"
Total Condition Points	Less than or equal to 30
Time to Next Overlay	Greater than or equal to 6 years

Overband Asphalt Crack Filling

The overband crack fill method involves blowing the crack clean with dried, compressed air and filling it with mixture of neat or modified binder mixed with polyester.

Crack filling prevents water from entering the pavement structure and reinforces the adjacent pavement

Asphalt crack filling is principally used for treating non-working cracks more than 1/8" but less than ½". Typical non-working cracks include: longitudinal reflective cracks, longitudinal cold joint cracks, longitudinal edge cracks, and distantly spaced block cracks. Visible surface distresses should be fairly straight open longitudinal and transverse cracks with slight secondary cracking and slight raveling at the crack face. Crack filling should not be used on longitudinal Fatigue cracking because of friction concerns. Crack filling is suitable for all traffic levels.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent<=5, Severity <= 3
Raveling	Total Score <=5
Other Cracking	Extent and Severity both <=3
Joint Separation	Less than or equal to 3
Rutting	Less than or equal to 3/8"
Total Condition Points	Less than or equal to 30
Time to Next Overlay	Greater than or equal to 6 years

Fog Seal

A fog seal is a light application of diluted asphalt emulsion.

Fog seals are used to seal the small cracks, inhibit raveling, and provide some enrichment to a hardened and oxidized surface.

A fog seal is appropriate for aged or raveled pavements. Pavements that are not raveled will not adequately absorb the mixture, resulting in a slick surface. However, extremely raveled roads may be beyond the point where a fog seal is beneficial. Fog seals should not be used when cracking is extensive or for cracks greater than 1/8". Due to the time required before traffic is returned, fog seals should be excluded from higher ADT routes.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 8 and >= 4
Other Cracking	Total Score <= 3
Joint Separation	Less than or equal to 1
Rutting	Less than or equal to ¼"
Total Condition Points	Less than or equal to 30
ADT	Less than or equal to 1500
Time to Next Overlay	Greater than or equal to 6 years

Sand Seal

A sand seal is the application of asphalt emulsion followed by a thin layer of sand to seal small cracks and protect pavements.

A sand seal is used to retard oxidation of an existing pavement, improve skid resistance and seal pavement surfaces on low volume roads.

Sand seals should be applied to roadway sections with moderate longitudinal and transverse cracking, minor amounts of secondary cracking, slight raveling, and slight to moderate polishing. Due to the current lack of experience with sand seals, they should be used only on low volume roads and on asphalt surfaced shoulders.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 8 and >= 4
Other Cracking	Total Score <= 3
Joint Separation	Less than or equal to 1
Rutting	Less than or equal to ¼”
Total Condition Points	Less than or equal to 30
ADT	Less than or equal to 1500
Time to Next Overlay	Greater than or equal to 6 years

Scrub Seal

A scrub seal is the application of asphalt emulsion followed by the broom scrubbing of the asphalt into cracks and voids, then the application of an even coat of sand or small aggregate, and finally a second brooming of the aggregate and asphalt mixture.

The treatment is used to retard oxidation of an existing pavement, improve skid resistance and seal pavement surfaces on low volume roads.

Scrub seals should be applied to roadway sections with moderate longitudinal and transverse cracking, minor amounts of secondary cracking, slight raveling, and slight to moderate polishing. Due to the current lack of experience with scrub seals, they should be used only on low volume roads and on asphalt surfaced shoulders.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 8
Other Cracking	Total Score <= 4
Joint Separation	Less than or equal to 2
Rutting	Less than or equal to ¼”
Total Condition Points	Less than or equal to 30
ADT	Less than or equal to 150
Time to Next Overlay	Greater than or equal to 6 years

Slurry Seal

A slurry seal is a mixture of slow setting emulsified asphalt, well graded fine aggregate, mineral filler, and water.

A slurry seal used to fill cracks and seal areas of old pavements, restore a uniform surface texture, seal the surface against water and air intrusion, stop raveling, and to improve skid resistance.

A slurry seal is primarily used to fill non-working cracks in the pavement. Slurry seals should be applied to roadway sections with moderate longitudinal and transverse cracking, minor amounts of secondary cracking, slight raveling, and slight to moderate polishing. Due to the current lack of experience with slurry seals, they should be used only on low volume roads and on asphalt surfaced shoulders.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 8
Other Cracking	Total Score <= 5
Joint Separation	Less than or equal to 2
Rutting	Less than or equal to ¼”
Total Condition Points	Less than or equal to 30
ADT	Less than or equal to 1500
Time to Next Overlay	Greater than or equal to 6 years

Ultrathin Friction Course

An ultrathin friction course is a gap-graded, polymer modified HMA placed on a heavy, polymer modified emulsified asphalt tack coat.

An ultrathin friction course is a functional overlay that can be used to improve friction and ride, reduce raveling and noise, and seal small non-working cracks. The heavy tack coat also serves as a barrier for the intrusion of water into the pavement surface.

Ultrathin friction course should be used on roadway sections with moderate longitudinal and transverse cracking, minor surface irregularities, rutting less than ½", polished surface, and moderate raveling Ultrathin friction course is suitable for all traffic levels.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Total Score <= 10
Raveling	Total Score <= 6
Other Cracking	Total Score <= 5
Joint Separation	Less than or equal to 3
Rutting	Less than or equal to ½"
Total Condition Points	Less than or equal to 35
Time to Next Overlay	Greater than or equal to 4 years and less than or equal to 8 years

Microsurfacing

Microsurfacing is a mixture of polymer-modified asphalt emulsion, mineral aggregate, mineral filler, water, and additives, properly proportioned, mixed, and spread on a paved surface.

A single course microsurfacing applied to a pavement will retard oxidization and improve skid resistance. A multiple-course microsurfacing application will correct certain pavement surface deficiencies including rutting, minor surface profile irregularities, polished aggregate or low skid resistance, and light to moderate raveling.

Microsurfacing should be used on roadway sections with moderate longitudinal and transverse cracking, rutting, minor surface irregularities, polished surface, and moderate raveling. Localized wheel path cracking or edge cracking should be repaired full depth. All existing cracks must be filled or sealed. Microsurfacing is suitable for all traffic levels.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Total Score <= 10
Raveling	Total Score <= 6
Other Cracking	Total Score <= 5
Joint Separation	Less than or equal to 3
Total Condition Points	Less than or equal to 35
Time to Next Overlay	Greater than or equal to 4 years and less than or equal to 8 years

4B Ultrathin Overlay

A 4B ultrathin overlay is a plant-mixed combination of asphalt cement and aggregate applied to the pavement in thicknesses of 5/8”to ¾”.

A 4B ultrathin overlay is a functional overlay that can be used to improve friction and ride, reduce raveling and noise, and seal small non-working cracks.

A 4B ultrathin overlay should be used on roadway sections with moderate longitudinal and transverse cracking, minor surface irregularities, rutting less than ¼”, polished surface, and moderate raveling. Ultrathin overlays are suitable for all traffic levels. However, until there is a better understanding of its performance, ultrathin overlays should be limited to sections that are not expected to experience significant shear forces such as those caused by heavy trucks braking or turning onto the pavement.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 6
Other Cracking	Total Score <= 5
Joint Separation	Less than or equal to 3
Rutting	Less than or equal to ¼”
Total Condition Points	Less than or equal to 30
Time to Next Overlay	Greater than or equal to 4 years and less than or equal to 8 years

Chip and Seal

A chip and seal surface is a combination of a bituminous binder layer and a fine aggregate layer. The aggregate is rolled and embedded into the binder and followed by a thin fog seal for aggregate retention.

Chip and seal surfaces can be used to address moderate cracking and raveling and provides a highly skid resistant treatment.

A chip and seal application should be used on roadways with moderate longitudinal and transverse cracking, minor surface irregularities, and rutting less then ½". Chip and seal surfaces should be limited to low volume roadways.

KYTC Pavement Management Evaluation Guidelines

Fatigue Cracking	Extent <= 5, Severity <= 3
Raveling	Total Score <= 8
Other Cracking	Total Score <= 5
Joint Separation	Less than or equal to 3
Rutting	Less than or equal to ½ "
Total Condition Points	Less than or equal to 30
Time to Next Overlay	Greater than or equal to 4 years and less than or equal to 8 years

Cape Seal

A cape seal surface is the application of the chip seal followed by a thin overlay treatment. The chip seal provides a waterproof membrane and adds a reflective crack barrier for the top surface treatment.

A cape seal is functional overlay that can be used to improve friction and ride, reduce raveling and noise, and seal cracks. It extends life and is more durable than a single thin overlay.

A cape seal can be used on roadways with moderate to high distresses such as longitudinal cracking, transverse cracking and raveling. Cape seals are suitable for all traffic levels, however the chip seal layer requires a curing periods before final surface overlay is applied

KYTC Pavement Management Evaluation Guidelines

Use of the cape seal treatments may be used in place of resurfacing treatments

Diamond Grinding

Diamond grinding is a process that uses a series of diamond tipped saw blades mounted on a shaft or arbor to shave off the upper surface (about ¼") of a rigid pavement.

Diamond grinding benefits include improved ride quality, removal of joint and crack faults, removal of wheel ruts caused by studded tires, restoration of transverse drainage, and improvement of skid resistance.

Diamond grinding should be used on roadway sections with joint and crack faults on average not exceeding ¼", rut depths less than ¼", and moderate to severe polishing. Structural distress and drainage problems require repair before grinding is conducted. Diamond grinding is not recommended for pavements with significant slab cracking or severe durability distress, such as D-cracking, alkali-silica reactivity, or freeze-thaw damage. The effectiveness of diamond grinding may be limited if significant pumping or loss of support exists.

KYTC Pavement Management Evaluation Guidelines

Joint Deterioration	Extent <=l to 5, Severity <= 3
Faulting	Total Score <= 6
Other Cracking	Extent <= 4, Severity <= 3
IRI	Greater than 130
Remaining Service Life	Greater than or equal to 10 years

Concrete Crack Sealing

Concrete crack sealing involves sawing, cleaning and sealing of concrete pavement cracks that are longer than 3 feet and wider than 1/8". For cracks wider than 3/8", a backer rod must be used.

Concrete crack sealing is intended to prevent or reduce the ingress of moisture and incompressible material into cracks, thereby slowing deterioration.

Slowly deteriorating concrete pavements are appropriate for crack sealing. Crack sealing is commonly performed on working cracks that are wide enough to permit significant infiltration. The pavement should have a low severity level of longitudinal and transverse cracks that do not exhibit significant spalling. Crack sealing is not usually done on Continuous Reinforced Concrete Pavement.

KYTC Pavement Management Evaluation Guidelines

Joint Deterioration	Total Score <= 4
Faulting	Total Score <= 4
Other Cracking	Extent and Severity both <= 3
IRI	Less than or equal to 130
Remaining Service Life	Greater than or equal to 15 years

Concrete Joint Resealing

Concrete joint resealing includes the removal of existing deteriorated joint seals, and resealing the transverse and longitudinal joints with hot-poured rubber.

Concrete pavement joints are sealed to prevent water and incompressible materials from entering the pavement structure. An effective joint sealant system is expected to reduce moisture accelerated distresses (such as pumping and faulting) and pressure related distresses (joint spalling and blowups) that result when slabs are unable to expand into transverse joints filled with incompressible materials.

Resealing can be done where existing joint seals have failed. Joint faces must be in good condition with little or no spalling. Joints should not be open more than 1" at any temperature and joint widths should not vary by more than 1/8".

KYTC Pavement Management Evaluation Guidelines

Joint Deterioration	Total Score <= 5
Faulting	Total Score <= 2
Other Cracking	Extent and Severity both <= 3
IRI	Less than or equal to 130
Remaining Service Life	Greater than or equal to 15 years

Concrete Pavement Repair

Partial depth repair is used to repair localized areas of surface deterioration within the upper one-third of the slab depth. Full depth concrete pavement repair consists of the removal and replacement of the concrete pavement at the deteriorated joint or open crack

Concrete pavement will restore pavement structural integrity and should maintain its existing ride quality. Secondary benefits include reducing the quantity of water entering the pavement structure and slowing the rate of distress.

The concrete pavement should be in good condition and deteriorating slowly. Transverse joints and cracks to be repaired should show severe spalling over their length. Other transverse joints and cracks with openings wider than ¼" or faulting more than 1/8" are appropriate for repairs. Repairs should not be performed on concrete pavements exhibiting significant levels of deterioration. It is most applicable to pavements in which deterioration is limited to a few joints and cracks and deterioration is not widespread over the length of the project.

KYTC Pavement Management Evaluation Guidelines

Joint Deterioration	Extent <= 3, Severity >= 3
Other Cracking	Total Score <= 8
Remaining Service Life	Greater than or equal to 5 years

Policies on Applicability and Calculation of Ride Quality Adjustments

Ride Quality adjustments will be applied in accordance with the Kentucky Department of Highways Asphalt Pavement Rideability Requirement Guidelines – effective February 25, 2008. Section 1.0 of this policy is to be used to determine when rideability requirements shall be included on projects. If rideability is required, the category of project will also be determined as outlined in section 2.0 of the policy. These guideilines are to be used for both asphalt and concrete pavements.

As per State Highway Engineer Policy #2008-10, projects let in or following October, 2008 will not be eligible for incentive payments involving rideability. However, penalties for ride quality adjustments will still be applied in accordance with the Pay Adjustment Schedule outlined in the version of the Standard Specifications for Road and Bridge Construction which is in effect at the time the project is let.

When a project is awarded with a rideability note, sections of the project which would have otherwise been eligible for bonus payments will first be calculated in order to offset sections that would result in a penalty. If the resulting total bonus payments within a project exceeds the total penalties, then the net result will be an adjustment of $0.00. If total penalties exceed bonuses, then the net result will be an adjustment equal to total bonuses minus total penalties. To clarify – ride quality calculations for each project may result in a total negative adjustment, but will never result in a total positive adjustment.

KENTUCKY DEPARTMENT OF HIGHWAYS
ASPHALT PAVEMENT RIDEABILITY REQUIREMENT GUIDELINES

1.0 APPLICATION. Section 410, Asphalt Pavement Rideability, of the Standard Specifications for Road and Bridge Construction should apply when a project's length is 0.4 miles (0.64 kilometers) or greater and any of the following conditions exist:

1. New construction projects – regardless of posted speed limit.
2. Surfacing projects involving two or more asphalt courses on high-type facilities and a posted speed of 45 mph or greater.
3. Surfacing projects on facilities with a posted speed of 45 mph or greater where significant milling or other surface preparation makes rideability requirements feasible.

The Department may apply rideability on project types other than the above or waive the requirements when deemed necessary. The Department will include a statement in proposals when the rideability requirements of Section 410 apply.

2.0 CATEGORY. Once a determination has been made that rideability requirements will be applied, the Department will establish the Pay Adjustment Schedule to be used based on the guidelines below.

Category "A" Pay Adjustment Schedule will be used unless any of the following conditions exist:

1. The route has a posted speed limit of 45 MPH or less.
2. Maintenance of Traffic requirements or other construction issues will result in excessive discontinuities in the surface course.
3. The project only involves a single asphalt course.
4. The surface type is classified as "experimental".
5. Other circumstances indicate that more stringent ride quality specifications would not be attainable or are not in the best interest of the Cabinet.

The Category "B" Pay Adjustment Schedule will apply if any of the above conditions are present.

APPROVED _____ 2/14/08
O. Gilbert Newman, P. E. Date
State Highway Engineer

APPROVED _____ 2/22/08
Jose Sepulveda, P. E. Date
Kentucky Division Administrator, FHWA

TRANSPORTATION CABINET
Frankfort, Kentucky 40622
www.transportation.ky.gov/

Steven L. Beshear
Governor

Joseph W. Prather
Secretary

STATE HIGHWAY ENGINEER POLICY #2008-10

MEMORANDUM

TO: Chief District Engineers
Director of Highway Design
Director of Materials
Director of Construction
Director of Maintenance
Director of Construction Procurement

FROM: O. Gilbert Newman, P.E.
State Highway Engineer

DATE: August 21, 2008

SUBJECT: Elimination of Pavement Incentive Payments
- Rideability
- Lot Pay Adjustments

Due to our current financial situation, we are continuing to review ways by which we can reduce project costs in order to maximize the amount of work we can accomplish within our financial limitations. One of the project cost reductions we have identified involves our current practice of paying incentives for pavement work that is incrementally better than our basic quality standards.

Effective with the October 2008 bid letting, projects containing pavement bid items will not be eligible for incentive payments involving rideability or lot pay adjustments.

OGN/CAK

c: Ray Polly
Bill Gulick
Bob Lewis
Rob Martin

Appendix F

Roadway Safety Audit

Road Safety Audit – KY 151

On Tuesday, May 10, 2016, one member from Central Office and three members from the District 7 Office conducted a Road Safety Audit (RSA) of KY 151 in Anderson and Franklin Counties. The RSA extended from US 127 in Anderson County to the I-64 interchange in Franklin County. The RSA team consisted of the KYTC District 7 Office and the KYTC Central Office, representing the Divisions of Highway Design, Traffic Operations, Permits, and the Highway Safety Improvement Program. The RSA began at 9:30am and concluded at 11:30am. The weather that day was sunny to partly cloudy. At the time the RSA was conducted, STAA trucks had already been prohibited. However, the RSA team observed many STAA trucks present on KY 151. There was a state trooper present that constantly had an STAA truck pulled over.

Current Roadway Conditions/Observations

The typical roadway section in Franklin County was measured to have 12' driving lanes, 2' paved shoulder, and an 8' earth shoulder. The typical roadway section in Anderson County, south of a curve revision project, had 11' driving lanes and 1' paved shoulder. This typical section continued until near the junction with US 127. Centerline and edgeline rumble strips were present in the 55MPH speed limit areas. Roadway signage was present and in moderate condition, but has not been updated to the 2009 MUTCD standards. Passing zones were observed in the 55MPH section. Three speed limit changes exist in this section of KY 151: 45 MPH from US 127B extending northward to a point 500' south of KY 512, 35 MPH from a point 500' south of KY 512 extending northward to a point 400' north of KY 512, and 45 MPH from a point 400' north of KY 512 extending northward for a distance of 850'. The description of the speed zones are taken from Official Order 102706. There were isolated areas of brush and canopy overgrowth. There were fourteen locations northbound and six locations southbound observed in

which embankment could be added. In Franklin County, the RSA team observed that the landfill has two entrances very near to each other. These entrances are also located in a lane drop area. Visibility of the roadway markings were obscured by dust tracking from trucks leaving the landfill. Superelevations and cross sections of the roadway were observed to be slightly incorrect in the 35 MPH zone.

Recommendations

Low cost measures that could be completed within 12 months would be to slope mow and canopy cut the roadway segment in needed areas. Dead trees near the roadway could also be removed. In Franklin County, the pavement in the southbound right turn only lane of the landfill has localized spots of mat tearing and shoulder failure. The distressed pavement and shoulders and other low shoulder areas could be repaired using maintenance state forces and contract. In Anderson County, where the typical section narrows, millings could be used to fill in low shoulder areas. The landfill could be contacted to install a new truck wash system to prevent dust from tracking onto the roadway. The landfill could also combine their two entrances into one. Corridor signing could be updated to the 2009 MUTCD standards. Passing zones and speed limit zones could be re-evaluated.

Measures that could be implemented that will likely carry a higher cost would be to improve the typical section of the roadway within the 55 and 45 MPH zones to match the typical section in Franklin County (12' driving lanes, 2' paved shoulder, and 8' earth shoulder). This would require engineered design plans to be prepared with right-of-way acquisition and utility relocation. Embankment could be added to areas that need it. It is likely that right-of-way or easement would need to be acquired for addition of embankment material. Superelevation and curve transitions throughout the corridor could be evaluated for corrective resurfacing. The lane taper to the entrance of the landfill could be re-striped to a lane-drop into the landfill. This may require some additional pavement width to be added and/or for this section to be resurfaced.

Kentucky Transportation Cabinet
Division of Planning